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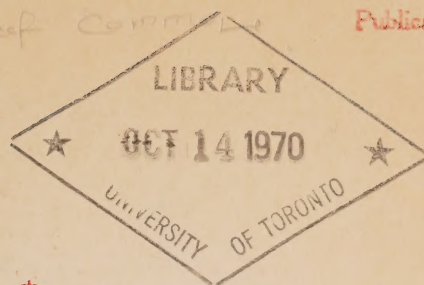
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Canada. Parliament, House of
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External Affairs and National
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Forces.

Tenth Report respecting
Maritime Forces, 2nd Sess., 28th
Parl.



TENTH REPORT OF THE STANDING COMMITTEE ON EXTERNAL AFFAIRS AND NATIONAL DEFENCE RESPECTING MARITIME FORCES

SECOND SESSION
28th PARLIAMENT

IAN WAHN M.P.,
CHAIRMAN



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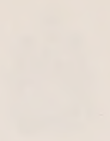
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RESPECTING
MARITIME
FORCES

ADOPTED BY THE
COMMITTEE ON

APRIL 1970

The Standing Committee on External Affairs and National Defence has the honour to present its

TENTH REPORT

Pursuant to its Order of Reference dated Monday, November 3, 1969, your Committee has considered Canada's policy with special reference to Canadian Maritime Forces.

The Committee assigned responsibility for detailed consideration of this subject to its Subcommittee on Maritime Forces, under the Chairmanship first of Mr. Perry Ryan, M.P. and then of Mr. Keith Penner, M.P.

The Subcommittee on Maritime Forces has submitted its report which the Committee has adopted, with amendments. The Committee believes that this report contains useful commentary and recommendations on the role of Canada's Maritime Forces. The report of the Subcommittee, as amended, reads as follows:

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PREFACE

Appointment and terms of reference:

On March 26, 1969, the House of Commons Standing Committee on External Affairs and National Defence noted in its Fifth Report (First Session, Twenty-Eighth Parliament) that it had not obtained sufficient evidence with regard to Canada's maritime forces to permit it to include recommendations with respect to them. Having stated that the subject would be investigated during the course of the Committee's continuing defence review, the Standing Committee subsequently on June 5 appointed by resolution under its general order of reference the Subcommittee on Maritime Forces to carry out the further investigations required. On November 4, 1969, the Subcommittee on Maritime Forces was re-appointed by the Standing Committee and, on November 27, given the following terms of reference:

"That the Subcommittee on Maritime Forces hear evidence on and report to the Standing Committee on External Affairs and National Defence on Canadian maritime forces."

The Subcommittee has interpreted its terms of reference to include all maritime forces maintained by the Canadian Government insofar as these have relevance, or potential relevance, for the maintenance of Canadian sovereignty in all its manifestations and the furtherance of Canadian foreign policy with respect to national security and other national interests. Accordingly, in addition to detailed study of the maritime forces maintained by the Department of National Defence, the Subcommittee has given some consideration to the maritime services of the Department of Transport, the Department of Fisheries and Forestry, the Department of Energy, Mines and Resources, and the Department of the Solicitor General (RCMP) but not to those maintained by the Department of Public Works.

Membership:

In the first instance Mr. D. Anderson; Mr. M. Forrestall; Mr. J. Guay; Mr. G. Laprise, Mr. A. MacLean; Mr. K. Penner; Mr. M. Prud'homme; Mr. P. Ryan, and Mr. H. Winch were appointed as members of the Subcommittee on Maritime Forces. Mr. Perry Ryan and Mr. Marcel Prud'homme were elected Chairman and Vice-Chairman respectively at organizational meetings held on June 19 and 26.

The Subcommittee was reappointed for the Second Session, on November 4, Mr. Ryan being re-elected as Chairman.

Following Mr. Ryan's resignation from the Standing Committee, and the appointment of Mr. N. Cafik, Mr. D. Groos and Mr. K. R. Hymmen to the Subcommittee, Mr. Keith Penner and Mr. Norman Cafik were elected Chairman and Vice-Chairman respectively on December 18. From December to completion of the investigation, the Subcommittee's membership included: Mr. Keith Penner (Chairman); Mr. N. Cafik (Vice-Chairman); Mr. M. Forrestall; Mr. D. Groos; Mr. J. Guay; Mr. K. R. Hymmen; Mr. A. MacLean; Mr. G. Laprise, and Mr. H. Winch, without further changes taking place.

The fact there were few changes in membership during the investigation was important for both the effective conduct of the Subcommittee's programme and the preparation of its report. This factor not only permitted the collection and examination of relevant information about a subject involving both complex and sophisticated strategy and technology in a cumulative manner with minimum repetition; it also ensured that members of the Subcommittee had equal opportunity to hear and consider all the evidence and facts and that differences expressed during consideration and preparation of the report were those of interpretation and judgment.

Visits to Halifax and SACLANT Headquarters:

With Mr. Perry Ryan as Chairman, the Subcommittee visited the Halifax area on September 7-11, 1969, for extensive briefings on the present role and operations of Canadian maritime forces—both military and civilian—based in that area. It received briefings by Vice-Admiral J. C. O'Brien, Commander Maritime Command; Mr. F. M. Weston, Regional Director of Marine Services, Maritimes, Department of Transport; Mr. R. N. Gordon, Regional Director, Department of Fisheries; Dr. W. L. Ford, Director, Atlantic Oceanographic Laboratory, Department of Energy, Mines and Resources; Inspector R. C. Butt, Officer in charge of Maritime Sub-division, Marine, Royal Canadian Mounted Police, and Mr. W. E. Markham, Director, Ice Control Centre, assisted by their respective staffs. The Subcommittee also had the opportunity to inspect ships and shore establishments, witness demonstrations of tactics and equipment, and to talk informally with personnel at all levels about their work. The visit provided invaluable background information and a feel for the subject that placed subsequent testimony by witnesses in Ottawa in a real perspective.

On February 15-17, 1970, the Subcommittee visited Norfolk, Virginia, for briefings by the Supreme Allied Commander Atlantic (SACLANT), the Commander-in-Chief of the United States Atlantic Fleet (CINCLANTFLT) and the Commander of Anti-Submarine Forces Atlantic (COMASWFORLANT) on the operations of Canadian maritime forces under NATO command and under the CANUS agreements. The briefings, given by Admiral E. P. Holmes, USN, in his capacity as SACLANT and CINCLANTFLT; by Vice-Admiral P. M. Compston, R.N., Deputy Supreme Allied Commander Atlantic; and by Vice-Admiral Paul Masterton, USN, (COMASWFORLANT) were particularly instructive both in terms of factual information obtained about the international context in which Canada's maritime forces operated and of the opinions expressed by those responsible for the conduct of allied naval operations about the requirement for and effectiveness of the Canadian maritime forces.

Briefings in both the Halifax area and at SACLANT headquarters were given *in camera*. While the Subcommittee would have preferred public meetings, it was recognized that thorough briefings and cross examination would not be possible in such circumstances, as much of the necessary background information in terms of which the policy issues had to be discussed was in whole or in part classified. In the event, the Subcommittee was given most thorough briefings during which assessments of the requirements for maritime forces and the capabilities of existing maritime forces were frankly discussed. Witnesses heard in Ottawa:

In its investigation the Subcommittee heard evidence in Ottawa from civilian experts and military staff officers on specific areas of concern. These included:

Professor L. W. Martin, Professor of War Studies, University of London, on maritime forces and modern strategy—(October 29, 30, 1969);

Rear Admiral J. A. Charles, Deputy Chief Comptroller General and and Captain (N) J. P. Côté, Directorate of Strategic Planning, Department of National Defence, on strategic questions relating to Canadian maritime forces (January 22, 1970);

Dr. G. R. Lindsey, Chief of the Defence Research Analysis Establishment, Department of National Defence (in his personal capacity) on alternative strategies relating to the Canadian maritime forces (January 27, 1970);

Commodore R. J. Pickford, Director-General Equipment Requirements, Captain (N) G. M. de Rosenroll, Director, Operational Readiness (Maritime); and Captain (N) T. E. Connors, Director Equipment Requirements Maritime (Surface), Department of National Defence on comparative costs and effectiveness of weapons platforms and systems for maritime forces (February 12, 1970);

Admiral A. H. G. Storrs, Director of Marine Operations, Department of Transport; Mr. J. A. Beesley, Legal Division, Department of External Affairs; and Captains (N) J. P. Côté; G. M. de Rosenroll and T. E. Connors, Department of National Defence, on maritime forces and arctic operations (February 5 and March 5, 1970, *In Camera*); and

Mr. I. H. Midgley, Director of Economic Analysis, Department of Regional and Economic Expansion on economic aspects of defence expenditure in the Atlantic provinces (March 19, 1970).

In addition to hearing evidence from the witnesses noted, the Subcommittee also received: a written submission by Dr. G. R. Lindsey entitled "Canadian Maritime Strategy: Should the Emphasis be changed?"; written information on capital costs and operating costs of maritime forces maintained by the Department of National Defence; and other relevant documents and publications from various sources (Details of the written material received are listed in Annex A of this Report).

Assistance of the Department of National Defence:

While all government departments maintaining maritime forces co-operated in every way to assist the Subcommittee in carrying out its investigation, the Subcommittee wishes to note the particular assistance rendered by the Department of National Defence. The Department co-operated to the fullest extent possible in arranging for its witnesses to testify at the convenience of the Subcommittee and to provide supplementary data where requested, and also made available transport facilities and arranged accommodation for the Subcommittee's visits to the Halifax area and SACLAN'T Headquarters. The Subcommittee gratefully acknowledges this assistance.

Dedication of personnel in Canadian Maritime Forces:

In the course of its investigation, the Subcommittee came in personal contact with many Canadians serving in the country's maritime forces. Their dedication to Canada, to their profession and to the accomplishment of specific tasks at hand was strikingly apparent. Such dedication has clearly been an essential element in the effective operation of Canadian maritime forces in the past and the Subcommittee is of the opinion that it will certainly be so in the future.

1. CANADIAN MARITIME INTERESTS

Canada has never been regarded as one of the great maritime nations. Such recognition has been traditionally accorded to great naval powers or to nations with a large merchant marine. While Canada has virtually no high seas merchant fleet at this time, it did develop a comparatively large navy and merchant fleet during the Second World War. Although the quality of Canadian naval forces remains high, these are now relatively modest in comparison with those of other states.

Canadians themselves, by and large, have taken the sea for granted and have not looked on Canada as having important maritime interests which need active protection. But this situation is very rapidly changing.

While Canada has no merchant marine of consequence, it is one of the great trading nations of the world with an interest in the free movement of commerce. Surrounded by oceans of strategic importance on three of four sides, it has had thrust upon it by geography an unwanted interest in the deployment of strategic weapons at sea and their effect on the balance of nuclear deterrence.

Canadian off-shore fisheries, which have in the past been so plentiful that they could supply the needs of all nations which cared to fish there, are in danger of becoming depleted owing to much increased fishing and the use of new and more productive techniques. Conservation programmes are now essential and these require enforcement. Recent technological developments have also suddenly made possible the exploitation of the sea bottom. Canada, with its vast continental shelf, which international law recognizes as being open to exclusive Canadian exploitation, has suddenly acquired enormous under-water territories which require some form of policing. The tremendous increase in sea transport of oil has opened up new dangers of pollution to every littoral nation, against which effective protection is urgently required.

That Canada has great maritime interests and obligations now and in the foreseeable future there can remain no doubt. But whether Canada has the appropriate maritime forces to protect these interests and meet all obligations in the changing conditions of the times is another question. It is with respect to the latter that this Report of the Subcommittee on Maritime Forces is submitted.

The subcommittee's interpretation of its task as involving an examination of all elements of Canadian maritime forces, both military and civilian, adds an unavoidable complexity to the Report. But the Subcommittee considers this justified by the wider focus it permits on the totality of Canadian maritime interests and maritime force needs. In this context, its recommendations are directed not only at the maritime forces maintained by the Department of National Defence, but also at all maritime forces maintained by the Canadian Government.

2. BACKGROUND CONSIDERATIONS

The Subcommittee found it necessary to take into account a number of factors of significance in the development and operation of maritime forces.

2.1 Lead-time Required for the Development of Maritime Forces

The lead-time required for the acquisition of specific equipment varies according to a large number of factors such as the degree of innovation

involved, the complexity and magnitude involved, the financial resources allocated, and the scientific, technological and industrial expertise and facilities available.

The long lead-time, amounting in some cases to several years, is significant in that the immediate roles and objectives that a nation's maritime forces may be expected effectively to carry out are limited to those within the capabilities of existing and operationally-ready equipment. Any changes in such roles or objectives beyond those within the existing capabilities are in consequence possible only after a given lead-time following the initial decision to acquire new or to modify existing equipment.

The lead-time can be reduced by either modifying existing equipment or by purchasing "off the shelf" equipment (when available), and modifying it if necessary, instead of designing and producing new equipment. However, even in the instance of acquiring "off the shelf" equipment which needs no further modification, a lead-time for initial assessment, delivery and training of personnel is still involved.

Bearing in mind the lead-time problem and the fact that the Canadian Government has already announced roles, objectives and equipment programmes for the maritime forces maintained by the Department of National Defence for the period ending 1972, the Subcommittee has considered it most appropriate to investigate the need for and to recommend roles, objectives and force structure for Canadian maritime forces for 1973-1983.

In considering the maritime forces for this period the Subcommittee has taken into account the capabilities of existing equipment that will still be in service subsequent to 1973, the capabilities of equipment presently under development that will be available for service during the period, and the capabilities of new equipment that could be acquired with the maximum lead-time available.

2.2 Life Expectancy of Maritime Forces Equipment

The useful life of equipment for maritime forces varies with the nature of the equipment. The expected life of hulls and propulsion units for surface vessels is in the order of twenty-five years, while that for airframes is less, depending in large part on utilization in flying hours. In each case mid-life modifications of subsidiary equipment and weapons systems can update or modify the level of performance and capabilities within the limits imposed by the basic hull structure or airframe.

Although equipment can be phased out prior to the termination of its useful life, as a result of unanticipated changes in roles and objectives (Section 2.4) or technologies (Section 2.3), the limit on national resources (Section 2.6) available for the development of maritime forces and the total investment in initial research, development and construction costs of equipment makes it unrealistic to consider that such an option could be generally followed. The Subcommittee therefore recognized that the long life to be expected from existing equipment represents a very real restraint in the capacity of maritime forces to assume new roles and objectives except in so far as the existing equipment or that already on order has the necessary additional capacity built into it.

2.3 Technological Change and Development of Maritime Forces

The differential between the life of basic platforms for maritime forces and the time during which specific subsidiary equipment such as detection,

data processing and weapons systems remain operationally effective due to subsequent technological development further affects the capacity of maritime forces to accommodate changes in roles and objectives.

The development of Variable Depth Sonar was a technological advance that greatly increased the effectiveness of existing surface ASW forces, an effectiveness that could otherwise be achieved only with the acquisition of alternate platforms such as bottom-based systems or submersibles. Similarly the development of automatic high speed data processing for analysis of sensory information has greatly increased the capacity of surface forces and aircraft acting together to localize and track of high performance nuclear powered submarines.

Conversely, technological developments or breakthroughs by other, potentially hostile, forces can suddenly and significantly limit the capabilities of existing maritime forces. The development of the snorkel for conventional submarines permitting recharging of batteries or running on diesel power without coming completely to the surface was a notable example of such a development suddenly severely limiting an existing capacity of forces to carry out a given role—in this instance surveillance, localization and tracking submarines.

In view of the sophistication and rate of innovation of current technology the Subcommittee concluded that it should not try to make detailed recommendations as to specific subsidiary equipment required for maritime forces. The Subcommittee is, however, convinced that Canada should keep up with those technological developments which will enable Canadian maritime forces to be effective in the specific roles which are, or may be, assigned to it.

2.4 Changes in the International Environment and Development of Maritime Forces

The Subcommittee considers that a further variable must be taken into account—changes in the international and strategic environment. In the light of expected international developments and Canada's evolving role in the world, it has investigated some roles and objectives for Canadian maritime forces which have in one way or another been suggested. It has assessed some as relevant for Canada (Section 5), discounted others (Section 6) and drawn conclusions as to the appropriate roles, objectives and force structure of Canada's maritime forces, for the 1973-83 period.

2.5 Regional Economic Expenditure, Technological Spin-off and Information Exchange, and Development of Maritime Forces

The Subcommittee has been impressed by the fact that the regional economic expenditure, technological spin-off and information exchange incurred in conjunction with the development of maritime forces is of such significance that these factors had to be taken into account.

Expenditures on the development and operation of maritime forces are of sufficient magnitude and concentration that changes in them would affect specific geographic areas and industries. Accordingly, even though the Subcommittee's recommendations relate primarily to Canadian defence and foreign policy needs in 1973-83, the domestic economic implications are briefly commented upon in Section 7.

Equipment for maritime forces makes extensive use of a vast range of technologies that are applicable to non-marine and more particularly to marine industry. For example, the Subcommittee anticipates a rapidly growing need for more intensive and extensive exploration, development and exploitation of

sea and seabed resources. Canada, with its long coastline and extensive continental shelf, can and should become a world leader in this field. Some of the new areas of marine technology could provide significant technological spin-off well suited for domestic exploitation and for commercial development. Accordingly, the Subcommittee has briefly considered some implications of the development of satellite surveillance systems, nuclear submarines, and hydrofoils from this perspective.

The Subcommittee further recognized that co-operation in research and development programmes for maritime forces, involving the exchange of scientific and technical information, can bring benefits beyond the immediate requirements of maritime forces themselves. These are briefly considered in Section 8.

In recognizing the domestic implications of economic expenditure, technological spin-off and information exchange, the Subcommittee rejected the view that the development of maritime forces solely in terms of effective support for defence and foreign policy is either possible, given the economic, technological and social linkages existing, or desirable, given the order of national resources involved and the potential side benefits attainable through such linkages. The Subcommittee assumed that a realistic and total assessment had to take into account not only the direct support for Canadian defence and foreign policy, but also the indirect support provided for other domestic policies of an economic and social nature.

2.6 Limit of National Resources and Selection of Priorities

Professor Martin noted in his evidence that some weapons systems are now available that even the richest nations in the world, the U.S.A. and the U.S.S.R., cannot afford. At subsequent hearings, other witnesses made numerous references to the limits imposed by the sheer cost of developing, procuring and operating equipment.

Such evidence pinpointed the most fundamental issue the Subcommittee had to face, namely the limit of Canada's national resources available for development and operation of maritime forces *in toto* and, in particular, for defence. While no specific level of expenditure on maritime forces for defence was cited in any evidence as a ceiling for such expenditure, there was an apparent underlying assumption that under present international conditions a ceiling in line with the present order of expenditure was likely to be maintained. The Subcommittee has accordingly recognized the necessity of making difficult choices in deciding on roles and future equipment.

3. ORIENTATION AND CAPABILITIES OF EXISTING MARITIME FORCES

Two predominant features of Canadian maritime forces are the division of maritime forces by department according to function, "police" type functions and military functions being almost completely separated, and the almost exclusive ASW specialization of Canada's armed maritime forces, particularly with respect to North Atlantic operations in a NATO context.

3.1 Division of Maritime Forces by Department

In addition to the Department of National Defence, five other departments maintain maritime forces: the Department of Energy, Mines and Resources; the Department of Fisheries and Forestry; the Department of the Solicitor Gen-

eral; the Department of Transport; and the Department of Public Works. (Details of the vessels actually maintained by these other departments are given in Annex B.)

A notable aspect of this division of maritime forces by function is the assignment of responsibility for police functions of a para-military nature to the maritime forces of departments other than the Department of National Defence. Specifically this includes: fisheries protection and regulation to the Department of Fisheries and Forestry; and enforcement of the Customs Act and associated regulations to the Royal Canadian Mounted Police. With the establishment of specific regulations for the *S.S. Manhattan* during its second voyage in the Canadian Arctic, the Department of Transport will probably exercise some form of police responsibility in ensuring appropriate safety standards are maintained.

Responsibility for research and data collection relating to the oceanic environment is assigned to departments with direct interests: oceanography and hydrography to the Department of Energy, Mines and Resources; fisheries research and oceanography to the Department of Fisheries and Forestry (including that for the Fisheries Research Board); and weather and oceanographic data collection as well as ice reconnaissance to the Department of Transport.

In addition, all the departments maintaining maritime forces have some responsibility to carry out support functions either as a prime responsibility (such as ice breaking, Arctic resupply, maintenance of navigation aids and cable repair) or as ancillary responsibilities (such as transport of departmental personnel and search and rescue).

The responsibilities and capabilities of departments other than the Department of National Defence to carry out police functions, research and data collection functions and general support functions stand in contrast to the present almost exclusive ASW specialization of the maritime forces maintained by the Department of National Defence. Insofar as the maritime forces of other departments have carried out, and are carrying out, these non-military and para-military roles, the Department of National Defence has to a large extent been relieved of any significant obligation in this respect (a notable exception being search and rescue). In consequence Canada has been able to assign its armed maritime forces purely military roles without having to accommodate necessary para-military and non-military roles often required of armed maritime forces.

3.2 ASW Specialization of Armed Maritime Forces

The Royal Canadian Navy, now the maritime element of the Canadian Armed Forces, has since World War II specialized almost exclusively in anti-submarine warfare in the Atlantic. The present orientation of these maritime forces, as announced in policy statements on defence policy and interim force structure, continues this specialization although with slightly less emphasis. On 3 June 1969 the Minister of National Defence stated that:

"Maritime command will continue in its anti-submarine role using most of the existing equipment... At the same time we are exploring the possibility of widening the roles open to maritime forces in response to the government's broad policy directive. In particular we expect more emphasis will be placed on activities relating to Canadian sovereign interests in our own adjacent waters and seabed. In this context our arctic territories take on a particular interest."

On 19 September 1969 he elaborated that:

"...we will continue to earmark virtually all of our Atlantic operational maritime forces for assignment to the NATO Supreme Allied Commander (SACLANT) in the event of an emergency."

Briefings by SACLANT indicated that such assignment would be for utilization in an ASW role. Later, on 3 March 1970, the Minister stated before the House of Commons Committee on External Affairs and National Defence that:

"...while we have no immediate plans to change the role or nature of these (maritime) forces, we are conducting studies to evaluate their contribution to our defence objectives, both in regard to their contribution to North American defence and to national objectives."

3.2.1 *Rationale for ASW Specification*

The initial post-war rationale for ASW specialization by Canadian maritime forces lay in the context of Canadian commitment to and participation in the North Atlantic Treaty Organization. Written evidence submitted by the Department of National Defence stated that in 1949:

"...the primary responsibility of the NATO maritime forces was to ensure the supply and resupply of Europe [in the event of a possibility of a land battle in Central Europe fought with conventional weapons]. The interdiction of shipping had now become an obvious Soviet intention. They had a cruiser program, presumably for use as commerce raiders but their main strength lay in 360 submarines with another 100 under construction. There were other tasks for NATO forces at sea of course, and the total requirement was for a balanced maritime force within the organization. Each nation was expected to concentrate on what they did best and could best afford. For Belgium it was minesweeping, while Canada, acknowledged to be an expert in the Anti-Submarine Warfare field, chose to emphasize shipping protection. So it was, that throughout this period the striking power of cruisers, gun destroyers and attack aircraft were given second priority as resources were allocated to the building up of an escort force. Added to the anti-submarine role, however, were the tasks of mine-counter measures, seaward defence of Canadian ports and support of the Army in their defence of Canada and United Nations roles."

In the 1958-63 period, Department of National Defence evidence indicated that the rationale changed, noting that:

"Since SACEUR lacked sufficient conventional forces to give validity to the doctrine of a holding action without the use of nuclear weapons against a massive Soviet assault, it was highly unlikely that the duration of a war in Central Europe would be long enough for seaborne supply to influence the outcome. Other than for operations on the flanks, the protection of shipping as a NATO task was lessening in importance."

If the submarine as a commerce raider was of less concern that it had previously been and if the mining of North American harbours seemed less plausible, the preoccupation with submarine counter-measures was not wasted. During this period, the first conversion of a diesel electric submarine was completed and the era of Russian submarine launched ballistic missiles began. As their only possible

targets were ashore, measures to protect the cities of North America had to be instituted and another task was assigned to the maritime forces.

The defence of Canada and North America against attack from the sea now was a problem of considerable substance and the first ASW agreement for the co-ordination of Canada/US forces was signed in 1963."

The official rationale for an ASW specialization in more recent years had been more vague. Asked specifically to justify the priority still being given to ASW, a Department of National Defence witness stated only that:

"...we must retain and improve our own ASW capability. I think the Soviet submarine fleet, and in particular the SLBM capability represented by that fleet poses the most serious threat to North America, including Canada...that this continent has ever faced. I cannot remember the exact number of SLBMs that the Soviets are able to deploy against North America at the moment...but I do know that it is estimated that their present capability will be increased by 800% within the next six or seven years. Their submarine building program is going ahead apace. This must be at considerable cost to the nation, and it must have a reason. So I see no alternative than that the Maritime Forces should retain their expertise in countering the submarine, and not only because of the SLBM. Many nations around the world are in possession of submarine fleets and in any of the roles of Maritime Command there will always be a threat, a potential threat from submarines."

Another Department of National Defence witness stated that:

"...analysis of strategy, capability and probability indicates that the primary and most serious threat in any type of war to the security of Canada, North America and the Atlantic Community is the submarine. Therefore, if we are to meet our stated defence objectives, be they the protection of our sovereignty, the contribution to the Alliances or indeed international peacekeeping forces, there is a requirement to maintain a submarine surveillance, tracking and neutralization capability in the Canadian armed forces."

The general tenor of evidence provided by officials of the Department of National Defence has indicated that the current official rationale for ASW specialization has three interrelated aspects to it:

First, an assertion that the security of Canada from direct attack or involvement in general war relies primarily on the principle of mutual deterrence, that Canada's ASW contribution increases the stability of the nuclear balance, and that co-operation with U.S. and NATO maritime forces is the only way to make an effective contribution in the ASW field. North American ASW forces are deployed so as to reduce the danger of a preemptive first strike by submarine-launched ballistic missile (SLBM's) against deterrent forces situated in continental USA. It is argued that continuous surveillance and some capability to destroy hostile submarines together encourage these submarines to position themselves at maximum range. This in turn provides maximum warning time of 15 minutes for SAC bombers (now regarded as the primary target of hostile SLBMs) to get airborne, and so contributes to the protection of the second strike capability of the West.

Secondly, it is asserted that the SLBM is a direct threat to non-military targets such as industrial and urban population centres. ASW forces in this

context have a damage-limiting role, by either pre-emptive destruction of hostile submarines prior to launch of SLBMs or destruction of such submarines after an initial SLBM launch to prevent further launches. An alternative method of defence not yet technically perfected involves the destruction of SLBMs after launch by ASW forces.

Thirdly, it is asserted that maritime forces used for shore bombardment, for logistic support of the battalion group in Canada assigned for use in Europe in an emergency, or in conjunction with United Nations peacekeeping operations could require protection against hostile submarines carrying out anti-shipping operations.

An additional argument frequently advanced for continued specialization in ASW appears to be the fact that Canada has developed a high level of expertise and made a substantial investment in specialized equipment for this type of operation in the immediate past. As long as both this expertise and equipment remain available for utilization, given a requirement for ASW operations, Canada can effectively carry out this role with the minimum amount of training and re-equipment required to keep up with the state of the art. The alternative of a major change in orientation would involve a much greater initial outlay of resources for re-training and re-equipment to reach an equivalent level of proficiency.

3.2.2 Professional Expertise of Canadian ASW Forces

The professional expertise of Canadian ASW forces is generally acknowledged as being second to none. This expertise is apparent in the actual conduct of exercises at sea, in the review of NATO ASW tactics being conducted by computers at the Joint Maritime Warfare School in Halifax, and in the development of new ASW equipment and concepts such as Variable Depth Sonar and the destroyer-helicopter team. It is, however, most clearly apparent in the successful surveillance and tracking of submarines in the CANLANT area of the North West Atlantic where the worst possible oceanographic conditions for ASW exist.

Specific areas of Canadian expertise in ASW have been developed in utilizing long-range maritime patrol aircraft, carrier-borne aircraft (fixed wing and helicopters), destroyers, and the destroyer-helicopter team. In addition, a limited amount of expertise has been developed with bottom-based detection systems. The one major area of ASW expertise, given the existing state of the art, in which Canadian maritime forces totally lack experience and knowledge is in the use of the submarine as an ASW platform. According to evidence received, submarines presently maintained and operated by the Department of National Defence are primarily used for training other ASW forces and not in an ASW capacity themselves.

A further potential area of ASW expertise involves the use of the hydrofoil as a platform and Canada is actively engaged in research and development in this area.

3.2.3 Capabilities of Canadian ASW Forces

The overall capability of Canadian ASW forces at present is difficult to assess due to the changing nature of undersea warfare (See Section 4). This results from significant changes in platform, with nuclear-powered submarines replacing conventional diesel-electric submarines, and in role, with submarines

now being used as platforms for SLBMs and for tracking and destroying hostile submarines in addition to their traditional use for anti-shipping operations.

a) capability against SLBM forces:

Department of National Defence evidence distinguished between ASW capability in terms of continuous surveillance of potentially hostile SLBM forces and actual defence against an SLBM attack. Canadian maritime forces, in conjunction with those of the U.S., have been and are actively engaged in SLBM surveillance. Evidence given in Halifax indicated that Canada has a moderate capability for surveillance of SLBM submarines in the CANLANT area with present forces. No specific evidence was reviewed as to its effectiveness in the Pacific area in this respect. However, Department of National Defence noted specifically with respect to actual defence against SLBM that: "...notwithstanding existing ASW capabilities, there is no fully effective SLBM defence in existence today."

b) capability against attack submarine forces:

Department of National Defence evidence stated that "...Canadian Maritime forces have a good capability to counter the threat of Soviet conventional submarines in Canadian areas of responsibilities..." and that Canadian forces are being equipped with some self defence capability against cruise missiles. This assessment made no distinction between Canadian capability against nuclear powered attack submarines and conventional powered attack submarines. The Subcommittee has concluded that Canadian capability against conventionally powered submarines is good. It is considerably less so with respect to the nuclear powered submarine in the attack role due to the latter's superior performance in speed and endurance.

A general assessment of present Canadian subsurface capability has also to take into consideration other factors such as the oceanic environment. While the Canadian capability in the open ocean of the CANLANT area is good for surveillance with respect to attack submarines, the same cannot be said of its subsurface capability in Arctic waters should this be required. Evidence submitted by Department of National Defence asserted that only maritime patrol aircraft, helicopters, submarines and bottom-based detection systems could operate in the arctic. The Subcommittee concludes that Canada has no effective subsurface capability in ice areas other than by means of intermittent and limited surveillance provided by maritime patrol aircraft during seasons when there is considerable open water. The Subcommittee has read of experiments being conducted with draft buoys for detection and transmission to aircraft of submarine sound data in ice conditions, but has received no information on their effectiveness.

3.3 Other Military Capabilities

In addition to a highly developed ASW capability, Canadian maritime forces have maintained other military capabilities. In general these fall into three categories: conventional strike and support; logistic support and transport; and mine counter measures. In some instances these capabilities are accommodated on what is primarily an ASW platform (i.e. destroyer escort or CS2F Tracker aircraft). While the inclusion of ancillary capabilities on ASW platforms to permit multi-tasking and to provide a certain degree of flexibility of operations undoubtedly adds to the usefulness and flexibility of such equipment in a variety of roles, the indivisible nature of the platform itself makes such multi-tasking an either/or option, unless the differing tasks

are demanded in the same *locale*. When conventional strike and support, logistical support and transport, or mine counter measures capabilities are required in areas other than where ASW operations are carried out, these capabilities can be exercised only as an alternative to ASW operations rather than in addition to them.

3.3.1 *Conventional Strike and Support*

Some equipment maintained by the Department of National Defence primarily for ASW also has conventional strike and support capabilities and can be used in this additional role.

CS2F aircraft, now shore based, have a limited strike capability, particularly in an anti-shipping context utilizing air-to-surface rockets and bombs. The DDEs and DDHs have a fair anti-aircraft, anti-shipping and shore bombardment capability utilizing 3"50 and 3"70 guns. The "O" class submarine, fitted with conventional torpedoes, can be utilized in an anti-shipping role. The introduction of the 280 class destroyer will provide additional shore bombardment and improved anti-aircraft capabilities.

Although it was suggested by Department of National Defence witnesses that air defence capabilities could be used for self-defence of maritime forces and that shore bombardment capabilities could be used in conjunction with UN peacekeeping operations, no specific statement of the probable use of such capabilities was given.

3.3.2 *Logistical Support and Transport*

One operational support vessel in service and two others under construction provide a limited capability for logistical support and transport both in conjunction with maritime operations at sea and overseas expeditions. Evidence has been given that destroyer escorts and other surface vessels can also provide transport facilities for limited numbers when absolutely required.

Written evidence submitted by Department of National Defence noted that since 1963 there has still been a requirement for combat and service support should NATO and/or UN operations require these. Specifically it noted that the assignment of a Canadian battalion group based in Canada to the Allied Command Europe Mobile Force (Land) established the need for sea transport and support.

3.3.3 *Mine Counter Measures*

Since 1963 Canada has maintained no capability for ship borne mine counter measures. Prior to that date Canadian maritime forces had operated up to ten mine sweepers for this role. However, the Department of National Defence has developed and maintained a skilled underwater repair and explosive disposal capability that can be employed to neutralize individual mines.

3.4. *Para-military and Non-military Capabilities*

In addition to having the military capabilities outlined above, Canadian maritime forces of the various departments have capabilities to carry out a number of para-military and non-military functions.

3.4.1 *Fisheries Protection*

The Department of Fisheries and Forestry maintains and operates a fleet of fisheries protection vessels with the responsibility, *inter alia*, for enforcement of fishing regulations and maintenance of the integrity of the Canadian fishing

zones. In 1969 the fisheries protection fleet comprised of 32 patrol vessels of 50' or longer (See Annex B) to carry out these and other tasks. In addition the department charters private aircraft for surveillance of the 12-mile limit. Written evidence submitted by Department of National Defence stated that a watch on foreign fishing fleets was also maintained by its maritime patrol aircraft.

Evidence received from Department of Fisheries and Forestry officials in Halifax indicated that only the two offshore special class vessels had the capability of enforcing the new offshore closing lines. Of the fisheries protection vessels located in the Atlantic Provinces region, 18 are maintained specifically for inshore patrol, 7 for inshore and intermediate patrol, including patrol of 12-mile limit, 2 (special class vessels) for patrol of 12-mile limit, patrol to offshore banks, and regulation of Canadian fishing vessels at sea with respect to regulations of the International Commission for Northwest Atlantic Fisheries (ICNAF).

3.4.2 *Law Enforcement Patrol*

The Department of the Solicitor General (Royal Canadian Mounted Police) maintains a fleet of vessels operated by the RCMP Marine Division with responsibility for law enforcement within territorial and inland waters, enforcement of the Customs Act and regulations, and the policing of small boat operation. These responsibilities have been exercised within the 3 mile territorial limit for foreign vessels and the 12 mile limit for Canadian vessels. In 1969 the RCMP maintained and operated 17 vessels 50' or greater in length (See Annex B) but operated no aircraft in conjunction with its maritime responsibilities.

3.4.3 *Shipping Assistance and Regulation*

The Department of Transport maintains and operates the Canadian Coast Guard which *inter alia* has responsibility for maintaining and supplying shore based and floating aids to navigation in Canadian waters. To carry out these responsibilities the Coast Guard in 1969 maintained and operated 72 vessels 50' or greater in length (See Annex B). The duties of the Canadian Coast Guard are presently civilian in nature. No armament is carried on Coast Guard vessels and the fleet has no police or para-military functions.

3.4.4 *Icebreaking and Arctic Resupply*

A major responsibility of the Canadian Coast Guard is to provide icebreaking services in the Gulf of St. Lawrence and the Arctic and to carry Arctic resupply. Five major icebreakers and 19 other vessels with some capability for operating in ice conditions are maintained for these purposes. In Arctic operations the same vessels (icebreakers) are used for icebreaking, Arctic resupply, marine traffic control and transport of scientific staff and equipment.

While the Subcommittee did not investigate the capabilities of the Canadian Coast Guard in detail, it is apparent that this service has developed a high level of expertise and a major capability in all non-military facets of Arctic operations.

3.4.5. *Hydrographic, Oceanographic and other Research and Data Collection*

(a) *The Department of Energy, Mines and Resources* maintains and operates 12 ships of 50' or greater in length for hydrographic survey, oceanographic research and limnological research. (See Annex B). The voyage of the

Hudson in 1969-70 around the North and South American continents is evidence of Canada's capability to mount a major oceanographic research project utilizing these facilities.

Evidence given to the Subcommittee in Halifax indicated that the main objectives of the Marine Science Branch of the Department is to assist through data collection and research the development of marine transport, offshore mineral resources, marine food resources, and environmental services (defence, weather, pollution and recreation). Oceanographic research carried out includes that on air/sea interaction, physical and chemical oceanography, marine geology, marine geophysics and instrument and systems development. Hydrographic surveys are carried out to fulfill requirements to provide modern navigation charts in accordance with the international charting programme to provide fishermen with charts tailored to their needs for exploitation of fisheries and to provide petroleum geologists and geo-physicists with charts as an aid in exploration for oil on the continental shelf.

Evidence given by Dr. W. L. Ford in Halifax noted that some oceanographic research is carried out in conjunction with Canada's support of the United Nations International Oceanographic Decade (1970-80) and conferences relating to the seabed and that Canadian activity in international oceanography would enhance Canada's voice in international discussion on the subject.

(b) *The Fisheries Research Board* maintains and operates 11 ships of the 50' or more in length for fisheries research (See Annex B). The FRB research results are used extensively by the Department of Fisheries in regulating actions and in arriving at international agreements concerning fisheries. The Marine Ecology Laboratory at the FRB carries out research in environmental oceanography (including physical oceanography, pollution studies, geology and geochemistry, and chemical oceanography), fisheries oceanography, and biological oceanography (including, *inter alia*, pollution detection and assessment).

(c) *The Defence Research Board* maintains and operates 4 ships for oceanographic and underwater research (See Annex B).

(d) *The Department of Transport* maintains and operates two oceanographic weatherships specially designed and constructed to man Pacific Ocean Station "Papa" and to collect and transmit meteorological data. The Department also maintains and operates six sounding and survey vessels as well as a hydrographic tender.

In addition *Ice Central* carries out ice reconnaissance and provides information on ice conditions in Canadian waters north of Newfoundland. It co-operates with U.S. agencies in carrying out ice reconnaissance north of Alaska and in the Thule region. Two aircraft are used for this ice reconnaissance, operating out of Moncton and Gander in the winter and Frobisher Bay and Cape Parry or Resolute Bay in the summer.

3.4.6 Search and Rescue

The Department of National Defence has the responsibility of co-ordinating and carrying out all air-sea rescue operations. Rescue Co-ordination Centres (RCC) are manned 24 hours a day by Canadian Armed Forces and Department of Transport personnel. The RCC keeps a continuous record of the positions of all aircraft and ships of the Canadian Armed Forces, the Canadian Coast Guard, the Royal Canadian Mounted Police, the Department of Fisheries and the Department of Energy, Mines and Resources as well as merchant ships of significance in order to divert them to assist in search and rescue, if necessary. In addition the Department of National Defence maintains aircraft specifically equipped for search and rescue and the Department of Transport maintains and operates ten search and rescue cutters at various locations (See Annex B).

4. CHANGING NATURE OF UNDERSEA WARFARE AND ANTI-SUBMARINE WARFARE

Consideration of the official rationale for ASW specialization by the Canadian maritime forces in any form has necessarily to take into account the changing nature of undersea warfare and anti-submarine warfare. The Subcommittee found that the development of the nuclear-powered submarine and of the submarine launched ballistic missile (SLBM) has fundamentally changed the nature of anti-submarine warfare from that of World War II and the immediate post-war period when Canada began to specialize in ASW.

In addition, current applications of submarine technology for military and non-military exploitation of the seabed have added a new dimension to undersea activity.

Finally, the requirements have changed. For reasons set out in Section 6, the Subcommittee concludes that there is unlikely to be a need for major resupply operations in a European conflict. Convoy protection had been the main focus of ASW activity. Since the convoy served to localize the area of potential conflict, it was an important aid to the defender.

4.1 The development and use of nuclear-powered submarines

The development and increasing use of nuclear-powered submarines, with the capacity to remain submerged for long periods of time, with endurance limited only by crew fatigue and with under-water speeds in excess of conventional surface vessels, has had the immediate effect of making ASW in a technical sense a much more difficult task. It has made initial detection and surveillance harder to achieve as a nuclear submarine does not have to surface regularly to recharge its batteries. Tracking and neutralization are also more difficult, once the submarine has been located, because of its increased speed.

In addition, the effectively unlimited endurance has made under-ice operations possible as a standard operating procedure, extending the range of such submarines into waters in which it is very difficult for aircraft or bottom-based systems to carry out ASW operations and impossible for surface vessels so to do.

Of greatest significance, however, the development of the nuclear-powered submarine has made possible the deployment of SLBM-armed submarines on a world wide scale by both the U.S.A. and the U.S.S.R.

4.2 Deployment of the SLBM Submarine

With the deployment of nuclear-powered submarines armed with ballistic missiles capable of being fired while the submarine remains submerged, the conduct of ASW has become much more difficult.

As a hostile SLBM-armed submarine has only to be within range of its target (now about 1500 nm) to be within effective striking position, and as it can remain submerged until, during and after an attack, its firing position cannot be readily predicted. In contrast to conventional attack submarines armed with torpedoes or cruise missiles which have to approach their targets at a much closer range, ASW defence against SLBM-armed submarines involves surveillance of a significantly larger and a more indefinite area of ocean. Further the fact that an SLBM-armed submarine does not have to come to periscope depth or to surface, for final target acquisition or launch, makes it much more difficult to locate as only sonar type or magnetic anomaly type sensors can be effective and their range is very limited.

4.3 Deployment of Soviet submarine forces

Evidence received by the Subcommittee indicated fairly conclusively that Soviet submarine forces have three distinct roles and are deployed accordingly.

First SLBM-armed submarines, having either a potential first strike or second strike role, are deployed within range of continental North America, primarily in the Western Atlantic.

Secondly, the primary role of submarines armed with cruise missiles is to attack U.S. carrier strike groups. Department of National Defence witnesses stated that only after this defence need was met did they expect these submarines to be employed against land or other shipping targets. Department of National Defence witnesses further noted that Soviet cruise-missile submarine forces are still being developed and that "...it is unlikely that this threat will diminish although its characters may change...Qualitatively the threat is increasing."

Thirdly, the primary role of conventional attack submarines is to provide in-depth defence of the U.S.S.R. against carrier strike groups and submarines. Department of National Defence evidence indicated that:

"After this task has been completed these submarines could be used in anti-shipping operations in the Atlantic and Pacific. Although the Soviets have some 300 conventional submarines, the extent to which they could be used for anti-shipping operations depends directly on the logistic support available to them in the Soviet Union. In a general nuclear war this could well be little, but in the event of a limited type of war or some US-USSR arms agreement this could be sufficient for a large scale anti-shipping war to be maintained for some time, particularly if such a limited type war was limited to a geographical war zone."

In addition evidence also indicated that, increasingly, nuclear-powered Soviet submarines are being deployed in the Western Atlantic (including the CANLANT area) while conventional diesel electric powered submarines are being deployed in the Eastern Atlantic. No specific breakdown was given on deployment in the Pacific but it would seem reasonable to anticipate a limited deployment of nuclear-powered submarines in the Eastern Pacific.

4.4 Development and use of submarines and bottom-based detection systems for ASW

In addition to improvements in the ASW capabilities of surface vessels and aircraft, the development and use of submarines and bottom-based detection systems for ASW represents another significant change in the nature of under-sea warfare.

The hunter-killer submarine developed and used by the United States and Great Britain as an ASW platform and weapons system matches the increased endurance and speed of nuclear-powered submarines. In addition, the facility to carry out ASW operations at the same depth as the hostile submarine overcomes the limitations imposed on surface vessel ASW operations by the existence of thermal layers in the ocean. In order to maximize their effectiveness hunter-killer submarines are designed and constructed to emit a minimum of sound during operations to ensure best possible reception of sound data and to avoid detection by their opponent. Such submarines can also carry

out ASW operations under ice. A Department of National Defence witness noted:

"...it is a matter of opinion but I think it is clearly regarded, particularly in the area type of work such as against a nuclear missile submarine, that they are extremely good, possibly the best answer to it, if any one weapon system can be considered...The principle is that the detection capabilities of submarines are far more consistently superior to those of ships and aircraft, one of the reasons being that they can operate at the best depth for the prevailing water conditions and target submarine movements. They can thus track their prey covertly from long distances, and of course they also have the weapons to be able to deliver the attack. The Americans are attaching considerable importance to the submarine as an anti-submarine vehicle...although what I just said may be true of any submarine, diesel electric submarines do not have the endurance to be really effective in the anti-submarine (SSK) role. It is because of the endurance of the nuclear submarine that the Americans are able to develop their SSK capability on a large scale. This is where the advantage lies—the definite endurance of the nuclear submarine—in that role."

In conjunction with this evidence, Professor Martin added:

"...the Russians have been developing a new attack submarine, the qualities of which have been regarded by the United States as indicating that it is the preferred Russian anti-Polaris system, a fast fire attack submarine. I would agree that the attack submarine is the best anti-submarine."

Evidence received by the Subcommittee indicated that although the U.S. Navy is reducing the number of ASW aircraft carriers and destroyers, it has increased the number of hunter-killer submarines for ASW operations.

Bottom-based detection systems represent another significant development in ASW technology. Consisting of extremely sensitive sound detection equipment either connected by underwater cable to landbased data processing and analysis centres or having the capacity to store data to be relayed to ASW aircraft by radio on demand, this equipment has the capability of detecting the sound of submarines and surface vessels passing within range and of roughly locating them. Through analysis of the sound data received, the submarine or surface vessel can be classified by type with a high degree of accuracy. Bottom-based systems are fixed and passive and therefore are, alone, capable of surveillance only. However, they appear to be of major significance in that they permit continuous surveillance and offer a classification capability over a fairly large area without the necessity of deploying manned forces continuously on patrol.

Published material indicates that the United States has a fairly extensive bottom-based detection systems (e.g. *United States Naval Institute Proceedings*, February 1969).

4.5 Wider application of underwater technologies for military and non-military exploitation of seabed

Evidence given by a number of witnesses suggested that the application of underwater technologies for military and non-military exploitation of the seabed, as well as for underwater commercial transportation, opens up a new dimension with respect to the use of submarines. Specifically, applications for the commercial exploitation of the continental shelf for the development

of mineral resources are expected to require underwater surveillance and policing to ensure that Canadian rights under the Geneva Convention of 1958 are recognized. An international agreement for surveillance and inspection under any Seabed Disarmament Treaty which might be negotiated would also lead to requirements for advanced technological nations to develop maritime facilities to realize these tasks.

4.6 Implications for Anti-submarine Warfare

The changing nature of undersea warfare has a number of implications for ASW. Most significantly the development of clearly differentiated operations, such as SLBM deployment and anti-shipping activity, requires increasingly heterogeneous and differentiated operations and forces to counter these distinct threats.

The assumption that the same specialized ASW force can or should be able effectively to cope with all submarines threats appears to be open to question. Evidence indicates that ASW operations in the Eastern Atlantic against hostile conventionally powered attack type submarines are of a different nature both technically and strategically than those against nuclear-powered SLBM-armed submarines. A sufficient level of effectiveness in the context of one (protection of shipping) is quite ineffective in terms of the other (damage-limitation of landbased military and non-military targets). The Subcommittee has taken these factors into account in formulating its recommendations in Section 10.

While undersea warfare operations have become differentiated, some ASW tasks have proven to be complementary in nature to other military and non-military tasks such as anti-ballistic missile defence and policing of the continental shelf. This has rendered obsolete to a large extent the concept of a self-contained ASW force at sea. Anti-SLBM defence as a component of a larger anti-missile defence system would require both land-based and sea-based defence components, to a certain extent interchangeable. Equally, for example, effective surveillance and combat of military and non-military exploitation of the continental shelf and submarine transport would require the complementary use of both military and non-military maritime forces in a police role. Both cases indicate that, increasingly, traditional ASW can no longer be justified on the grounds that any undersea operation has to be met at sea. It has to be justified as a component in an overall defence system involving other non-ASW—indeed non-maritime—components to meet threats that may incidentally originate from under the sea.

The concept of subsurface maritime activity has, in fact, changed and broadened to the extent that the term ASW is now misleading. For this reason the Subcommittee has deliberately, in its conclusions and recommendations, identified specific functions and capabilities in this respect which it considers are required to meet Canadian interests.

5. STRATEGIC CONSIDERATIONS FOR THE 1970's

5.1 Maintenance of Canadian Sovereignty and Extra-territorial Jurisdiction

The fact that Canada has the longest coast line and as large an area of associated continental shelf as any country in the world is a strategic consideration of great importance.

Whereas defence against any major military violation of Canadian sovereignty is assured by the over-arching U.S. interest in world and continental

security (and defence capability commensurate with this), the same support is not assured for violations of a non-military nature. With the sudden appreciation of the potential value of seabed resources and the need for new kinds of measures to protect fisheries resources, Canadian sovereignty and extraterritorial jurisdiction may be subjected to new challenges. An appropriate police capability is therefore increasingly necessary.

To date the responsibility for police functions required has been carried out by the maritime service of various government departments (see Section 3.4) which have no capability for underwater operations. However off-shore exploration for oil and other resources on the continental shelf and the possibility of submarine transportation of such resources in the Arctic archipelago (as outlined by General Dynamics Ltd. to the House of Commons Standing Committee on Indian Development and Northern Affairs on May 21, 1970) adds an underwater dimension to such police requirements. While Canadian maritime forces for the exercise of these police functions appear to have been adequate to date, the Subcommittee anticipate a need for further police capabilities both on account of greater surface activity and the development of underwater activity.

In essence the police function to be exercised is a manifestation of national sovereignty. Since the countries likely to challenge such assertions for commercial or other reasons include the USA and other NATO countries, the Subcommittee considers that Canadian maritime forces must be capable, unilaterally, of carrying out any increased police functions.

5.2 Continued Existence of U.S.-U.S.S.R. Deterrence System

Evidence submitted to the Subcommittee suggests that during the next decade the U.S.A. and the U.S.S.R. will seek to maintain their respective nuclear deterrent capabilities and that SLBM submarine forces will probably become an increasingly important element in these forces. There is also some possibility that each side may develop and deploy missile systems on the seabed, although agreement on a Seabed Disarmament Treaty could exclude such a development.

The Subcommittee is of the opinion that Canadian security depends in a strategic sense upon a preservation of a nuclear balance. This applies as much to threats from the sea as from the air or outer space. At present, even with the close co-operation and full support of U.S. ASW forces, which are substantially larger than those maintained by Canada, it is difficult to survey the CANLANT area and to track nuclear-power submarines if they are detected. To do so with existing Canadian maritime forces alone and without intelligence on submarine transits through adjacent seas policed by Canada's allies would be virtually impossible. Moreover the United States Navy would probably take over policing of the CANLANT area in order to prevent hostile submarines from taking position off Canada's east coast from which they could attack the north-eastern seaboard.

The Subcommittee therefore considers that it is in Canada's interest to make a limited contribution to the co-operative defence arrangements for surveillance and control off the east and west coasts of Canada. The Subcommittee contends, however, that priority in Canadian maritime defence arrangements should be given to the maintenance of Canada's sovereign interests, especially in the Arctic. It concludes, therefore, that Canada's participation in joint ASW efforts should be kept under periodic review to assure that these arrangements are not carried forward to the detriment of Canada's principal objectives, given

the limit of financial resources available for maritime defence. The Subcommittee accepted the argument advanced by Dr. G. R. Lindsey that "as an absolute minimum it would be desirable to maintain a degree of surveillance to ensure that we do not remain unaware of a large scale increase in activity".

Another National Defence witness elaborated on this requirement in the following terms:

"Surveillance is, of course, of paramount importance. . . It provides a valuable source of intelligence as to possible enemy intentions. It must be a sustained and continuous process.

However it is not sufficient to know the nature of the enemy deployment at any given time but requires that the normal pattern of deployment be established so as to be able to detect any change in that pattern. Such changes, analyzed in the light of the prevailing political situation and other sources of intelligence can provide warning of an impending attack or of a development of strategic or political importance. Surveillance must therefore be maintained over wide areas of possible missile submarine operation. . ."

The Subcommittee agreed with Professor Martin's evidence that a capability to carry out active surveillance was important for Canada's security:

"...a limited anti-submarine warfare capability such as is within Canada's competence would ensure a degree of Canadian access because of the information it can produce itself; second because it is a participant of the information that is provided by others and thus would have some control over the information provided by others. This would seem worthwhile having and would seem a major function of it. . . Canada's security is rather great and is provided by some of the other international deterrent systems. But a certain amount of capability to reconnoitre, to identify behaviours and perhaps even to thwart that behaviour on a very small scale could be regarded as a kind of activating mechanism, a sort of general deterrent balance within which Canada lives."

5.3 Future Support for a Seabed Disarmament Treaty

Canada has been a leading proponent of a Seabed Disarmament Treaty requiring effective inspection capabilities. With a draft U.S.—U.S.S.R. treaty now being discussed, Canada may well become party to such a treaty during the 1973-83 period. Since Canada is a technologically advanced nation with proven expertise in the ASW field, Canada would be in a position to provide inspection capabilities if requested. In terms of both the development of technical expertise and strategic alignment, the Subcommittee concludes that this is a long-term consideration relevant in planning future capabilities of Canadian maritime forces.

6. DISCOUNTED STRATEGIC CONSIDERATIONS

The Subcommittee examined a number of possible roles and operations of Canadian maritime forces that have been advanced at rationales for the structure of Canadian maritime forces in the past and concluded that they were not realistic. These possible roles have been discounted because they involve scenarios that the Subcommittee considered most improbable or because they

were of such a marginal nature as to be relatively insignificant in determining the overall capabilities of maritime forces. As evidence of several witnesses indicated, however, maritime forces are flexible to a degree and, with certain improvisation, can be used to carry out unanticipated roles to a limited extent. It is assumed that some of the roles discounted here could in fact be carried out if the need arose, albeit with less than optimum effectiveness.

6.1 Convoying

The primary objective of Canadian ASW specialization during the Second World War and in the first decade of NATO's existence was to provide protection for convoys supplying Europe. The Subcommittee has concluded that no need for convoy protection can be envisaged in any likely military eventuality.

The Department of National Defence gave evidence that as of 1958 "... it was highly unlikely that the duration of a war in Central Europe would be long enough for seaborne supply to influence the outcome." In his testimony Professor Martin noted that the concept of convoying had reached a point of minimum credibility. Dr. Lindsey's written evidence on the effect of recent strategic developments in 1956-63 on the need for protection of convoys supported this conclusion.

6.2 Limited Nuclear War at Sea

In his written evidence Dr. Lindsey raised the possible contingency of a limited nuclear war at sea. Your Subcommittee found Professor Martin's evidence particularly persuasive on this point. Department of National Defence witnesses further supported this finding, specifically, within the NATO context.

After considering the evidence of both the Department of National Defence and Professor Martin on this point, the Subcommittee conclude that limited nuclear war at sea is difficult to envisage and that Canadian maritime forces need not be equipped to meet such a danger.

6.3 Support of U.N. Peacekeeping

The provision of naval support for peacekeeping operations was suggested as a continuing requirement for Canadian maritime forces by the Department of National Defence in its written evidence.

In his evidence Professor Martin noted that it was highly unlikely that the Canadian government would agree to become involved in peacekeeping operations without broad international support. In these circumstances there would be no requirement for maritime support facilities other than possibly for transport, which could be civilian.

While the Subcommittee believes that Canada should continue to participate in U.N. peacekeeping operations, it does not envisage a requirement for naval support, either to conduct shore bombardment or to provide ASW, anti-aircraft or anti-shipping protection. Canadian maritime forces have on only two occasions been used in conjunction with peacekeeping operations, in both instances providing unopposed transport facilities. The Subcommittee considers that vital and specialized roles for which Canadian maritime forces will be required should not be compromised by making special accommodation for peacekeeping support.

6.4 Surface Operations of a Military Nature in the Arctic Archipelago

The Subcommittee sees a requirement for forces capable of carrying out surveillance and for investigating and identifying military and non-military

activity in the Arctic archipelago (see Section 10.5). But the Subcommittee does not anticipate a need for maritime *surface* operations of a military nature in Arctic waters because ice makes such operations virtually impossible. Any necessary challenge to individual surface vessels could be effectively made by the appropriate registration of political protest. If a demonstration of force were required, armed aircraft would be most effective.

7. ECONOMIC ASPECTS OF MARITIME FORCES DEVELOPMENT

7.1 Current expenditure

Information provided by the Department of National Defence indicated that the capital and operating costs for that department's maritime forces are as follows:

a. Originating capital cost of present naval forces including Maritime Air but not including non-combatant vessels.	\$1,012,232,000
b. Annual Operating and Maintenance costs including MARCOM bases, dockyards, etc.	\$244,084,000
c. Cost of new equipment including development, conversion and modernization programs for ships and aircraft for which some cash provision is made in 1969-70 Estimates	
Expenditures prior to 1969-70 (of which \$129,122,000 is included in total for is included in total for a.)	\$433,000,000
Forecast expenditures 1969-70	\$113,740,000
Future Years	\$170,649,000 \$718,389,000

Information provided by other departments maintaining and operating maritime services indicated that the operating costs in 1968-69 of their vessels were as follows:

Transport	\$26,801,000
Energy, Mines and Resources	\$ 3,730,895
Fisheries and Forestry	\$ 2,436,300
Fisheries Research Board	\$ 1,107,331
Solicitor General	\$ 1,380,924
Defence Research Board	\$ 1,233,998

Major portions of this expenditure appear to be concentrated in particular industries and particular regions.

7.2 Implications for the Atlantic provinces

While the Subcommittee was not able to obtain comparative data as to the implications of expenditure on maritime forces in the various regions of Canada, it received some evidence on the implications of defence expenditure in the Atlantic provinces for 1960.* Although the data was historical and did

*Kari Léviitt. *A Macro Economic Analysis of the Structures of the Economy of the Atlantic Provinces 1960*, McGill University 1969.

not differentiate between defence expenditures on maritime forces and those on land or air forces, it confirmed that defence expenditure was a significant source of household income and of employment in all the Atlantic provinces and in particular, Nova Scotia.

Analysis using one model indicated that defence expenditures contributed the following amounts to household income in 1960:

Province	\$ million	% of total
Nova Scotia	110.2	13.8
New Brunswick	28.6	4.9
Newfoundland	11.0	2.9
Prince Edward Island	9.2	10.4

Use of the same model indicated that the defence expenditures resulted in the following employment in 1960:

Province	thousands	% of total
Nova Scotia	25.2	13.3
New Brunswick	6.2	4.8
Newfoundland	2.4	2.4
Prince Edward Island	2.0	10.0

Information received by the Subcommittee during its visit to Halifax area suggested that possibly as much as 40% of the total population of that area consisted of military personnel, Department of National Defence civilian employees, dockyard workers and dependents.

The Subcommittee concluded that in the Atlantic provinces defence expenditure, in the main on maritime forces, is of such economic and social importance that it represents a legitimate consideration in any development or restructuring of maritime forces.

7.3 Implications for other regions

No data of a similar nature was available for other regions of Canada, including British Columbia. The Subcommittee believes that input-output economic studies of all regions of Canada are an essential tool for effective promotion of regional development and would be important in considering the impact in different parts of the country of defence expenditure.

7.4 Implications for industry

The magnitude of equipment procurement programmes for the development of maritime forces has important implications for the development of particular Canadian industries. This fact has long been recognized in the practice of having vessels of Canadian maritime forces constructed in Canadian shipyards. A notable exception has been the purchase of submarines built in the United States or the United Kingdom, a consequence of which is a lack of expertise or facility in this highly specialized and increasingly important area of maritime technology.

8. COLLECTION, CONTROL AND EXCHANGE OF STRATEGIC AND TECHNICAL DATA

Canadian maritime forces, particularly those of the Department of National Defence, depend in part on an international exchange of strategic

and technical data for the effective conduct of operations and the development of equipment. Evidence received by the Subcommittee indicates that such exchanges are facilitated by the active participation of Canada in NATO and in cooperation with the United States.

8.1 Strategic information

Professor Martin noted in his evidence with respect to strategic information that:

"...if one wants to have influence it is exceedingly important to remember that one needs to have information as to what the world situation is. I am inclined to believe that in military and political matters, he who has got something gets something. Therefore, some participation in allied naval tasks would...be the price that one would have to pay for some reliable conviction that one was being privy to the information upon which the alliance was operating."

Later, he added:

"Many countries cannot provide themselves with first-hand knowledge of everything but I would have said that a limited anti-submarine warfare capability such as is within Canada's competence would ensure a degree of Canadian access, because of the information it can produce itself; second, because it is a participant of the information that is produced by others and thus would have some control over the information provided by others. This would seem worthwhile having and a major function of it."

Dr. Lindsey's evidence with respect to information on sub-surface arctic operations further supported the conclusion that only by some active participation in such operations could any significant exchange of strategic information in this area be anticipated.

The Subcommittee was convinced by this, and other classified evidence, that these observations are valid. The cost of obtaining unilaterally all the strategic information required for Canadian national security would be prohibitive, whereas it can be had from close allies at no cost at all. The Subcommittee concludes that an important benefit of cooperation with allies lies in the strategic information which is exchanged.

8.2 Technical and scientific information

The Subcommittee reached the same findings with respect to the exchange of technical and scientific data.

Professor Martin pointed out that the crucial importance of research and development is to prevent discrepancy in level of defence technologies to the advantage of any potential adversary. Noting that the United States leads in everything in this area, he added that:

"...the American technological co-operation you get in areas where you are out of the business and you are simply riding on the fact that you are an ally...is sharply different from the amount of technological information and co-operation you get if you have got something to put into the pot."

Asked by the Subcommittee whether there were instances when Canada had been denied access to information, strategic or otherwise, Dr. Lindsey testified that:

"It is difficult to quote exact numbers. Not too long ago we did make a survey of the number of reports that have been coming in from some of our allied countries and it is much less than it used to be. Of course we do not know what reports have been written...but it seems surprising that they are getting fewer. I think we find ourselves invited to less exchanges of information and scientific and technical meetings than we were. So we have more a feeling than a proof. I do not know of any case where we knew that there was something and did not get it...It is a little more subtle, but I am afraid the cumulative effect of it is rather serious."

The Subcommittee concludes that the need to obtain technical and scientific information available from the United States and other NATO countries and relevant to Canadian defence and other needs is great. While this consideration appears relevant to all defence arrangements, the Subcommittee concludes it is particularly relevant with respect to maritime defence arrangements given the degree of sophistication (and expense) of scientific and technical data involved.

9. PRIORITIES AND CRITERIA IN ALLOCATION OF ROLES FOR CANADIAN MARITIME FORCES

9.1 Maintenance of Sovereignty and Enforcement of Extra-territorial Jurisdiction

The Subcommittee considers that the first responsibility of Canadian maritime forces during the 1970s must be the maintenance of sovereignty and enforcement of extra-territorial jurisdiction.

As already noted (Section 5.1), Canadian maritime forces need an independent capability to carry out police functions—military and non-military—required to maintain sovereignty and enforce extra-territorial jurisdiction. This is a requirement which has recently taken on vastly increased importance as a result, on the one hand, of rapidly growing exploitation of the continental shelf as defined and permitted by the Geneva Conference on the Law of the Sea, and on the other hand by the extension twice over the past six years of Canadian fishing zones and the recent extension of Canada's territorial sea from 3 to 12 miles. Moreover, the increased attention to the Arctic where Canada has longstanding claims to sovereignty over the waters between the islands (which have now been greatly strengthened by the extension of the territorial sea), as well as the establishment of an extensive pollution control zone, have created further requirements. However, because the Arctic waters are frozen or ice-covered most of the year, these latter requirements call for a special solution. (See Section 10.5).

The Subcommittee is of the opinion that effective maintenance of sovereignty requires a capability of extensive surface and subsurface surveillance and identification, as well as a limited capability to localize and track specific instances of exploitation or violation—whether these be of resource rights on the continental shelf, transport regulations, customs regulations or fisheries regulations to name obvious examples. There is a further requirement for some limited but effective capability to challenge any actual instance of illegal exploitation or other violation of Canadian laws.

In view of the increasing use of submarines with long endurance, already for military purposes and possibly soon for commercial purposes, the maintenance of sovereignty must be supported by some capability for subsurface surveillance and tracking.

9.2 Contribution to Collective Security

The Subcommittee has already in Section 5.2 concluded that Canada has an interest in making a limited contribution to collective security arrangements for surface and subsurface surveillance and control off the east and west coasts of Canada. A Canadian contribution to collective security arrangements in the form of maritime forces could take several alternative forms.

The Subcommittee agreed with Dr. G. R. Lindsey's assessment that two specific roles related to the protection of the Western strategic deterrent at sea—protection of U.S. Fleet Ballistic Missile submarines and of the Western maritime strike forces—were not suitable for Canada.

It also examined a number of other roles which have been or are sometimes suggested as being likely or appropriate for Canada. It concluded that in present circumstances Canada does not need specialized maritime forces: (1) for trans-oceanic conveying; (2) for surface conflict in the Arctic; or (3) for engaging in a limited nuclear war at sea in any form (detailed in Section 6).

The Subcommittee concludes that a combination of forces with subsurface capabilities continues to be an appropriate and effective contribution of maritime forces which Canada can make to collective security. It also serves an additional Canadian interest of ensuring that Canada's allies recognize that responsibility for protecting the maritime approaches to Canada lies with Canada. Finally this role employs many similar forces to those required for maintenance of sovereignty and the enforcement of extra-territorial jurisdiction.

In making this recommendation, the Subcommittee wishes to affirm explicitly its opinion that the roles and capabilities of Canadian maritime forces should be unambiguously defensive.

9.3 Requirement for Multi-tasking of Equipment and Personnel

The Subcommittee favours greater multi-tasking of equipment and personnel between Canadian departments maintaining maritime forces than has been the case. Given the priority the Subcommittee has assigned to the police function and the new requirement to apply Canadian regulations in the expanded territorial sea, as well as in the fishing and pollution control zones, the Subcommittee believes that increased cooperation between the maritime forces of different Departments in support of specific Canadian policies and regulations is indispensable. This represents a rather new approach, but one which the Subcommittee considers to be justified in view of the high initial cost of providing equipment and training personnel and the subsequent cost of maintaining them.

The Subcommittee has noted that the maritime forces of specific departments of government are already multi-tasked in terms of departmental responsibilities. Thus, some of the maritime forces of the Department of National Defence have a flexibility which permits them to meet various defence contingencies which may arise. Ships of the Departments of Transport, of Fisheries, and of Energy, Mines and Resources are also multi-tasked. Thus the icebreakers

operate in the Arctic in the summer on re-supply and keep open shipping lanes in the St. Lawrence River in winter. However, with a few exceptions, there seems to be little multi-tasking of maritime forces maintained by one department for roles assigned to another department. The exceptions which the Subcommittee has noted include: (1) hydrographic and oceanographic research and other data collection, where Department of Transport vessels accommodate oceanographic research staff and provide facilities for meteorological data collection, and where Department of National Defence vessels provide limited facilities for meteorological data collection; (2) search and rescue, where all departments make available the capabilities of their maritime forces; and (3) surveillance of foreign fishing fleets, where the Department of National Defence utilizes the capabilities of its maritime patrol aircraft.

The Subcommittee has some specific suggestions to make in Section 11.

9.4 Inspection capability for possible Seabed Disarmament Treaty

The Subcommittee fully supports Canadian diplomatic initiatives to realize an effective Seabed Disarmament Treaty and recommends that Canada, if requested, provide appropriate maritime forces for sea-bed inspection to ensure compliance. At present the hypothetical nature of such a requirement and the uncertainty of capabilities that would actually be required for inspection make specific recommendations for capability in this respect impossible. However, the Subcommittee considers that development of technical expertise and operational experience in the provision of other subsurface capabilities recommended will be of direct relevance to any future development of an inspection capability for seabed disarmament purposes. In the opinion of the Subcommittee, planning of Canadian maritime forces for the 1973-1983 period should include allocation of resources for research and development of techniques and equipment for such inspection.

10. CAPABILITIES FOR CANADIAN MARITIME FORCES

The Subcommittee has directed its inquiry primarily into the maritime forces required for the maintenance of Canadian sovereignty in all its manifestations and for furthering Canadian international interests and security. It accepted without further detailed investigation that there would be a continuing need for maritime forces for shipping assistance, ice breaking and Arctic resupply, research and data collection and search and rescue and that some elements of any Canadian maritime forces would have to have specialized capabilities in these areas.

For the maintenance of Canadian sovereignty and the furtherance of international security and other Canadian international interests, the Subcommittee recommends the following capabilities for Canadian maritime forces in the 1973-83 period, as explained in greater detail below:

- considerable surface and subsurface surveillance and identification capability
- limited surface and subsurface tracking and localizing capability
- limited surface and subsurface challenge/destruct capability
- limited self-defence capability.

These recommendations apply primarily to the maritime forces of the Department of National Defence but also have some implications for those of other departments.

10.1 Considerable surface and subsurface surveillance and Identification capabilities

The Subcommittee recommends that Canadian maritime forces have—or have access to—considerable surface and subsurface surveillance and identification capabilities sufficient to cover the continental margin and such areas of the Atlantic and Pacific Oceans to meet international obligations accepted by the Canadian Government. This capability should be such as to ensure prompt detection and identification of all surface, subsurface and sea bottom maritime activity, whether military, commercial or otherwise in nature.

10.2 Limited surface and subsurface localizing and tracking capability

The Subcommittee recommends that Canadian maritime forces have a limited localizing and tracking capability within the specified areas on the East and West coasts. By limited capability, the Subcommittee explicitly recommends a capability such that a limited number of separate maritime activities (military, commercial or otherwise) can be precisely located and tracked on a continuous basis if and when required.

The Subcommittee has noted that in the past Canadian maritime forces have had a more extensive localizing, tracking and challenge and/or destruct capability than they now have to meet surface and subsurface maritime activity. These forces have been run down in the last decade and the Subcommittee considers this has been justified.

The Subcommittee was informed that it would be feasible to reacquire an extensive localizing and tracking capability for *surface* maritime activity. However, it concluded this is unnecessary, given (1) a considerable surveillance and identification capability with a fairly rapid revisit cycle, (2) the relatively slow movement of surface ships, and (3) the ease with which surface vessels can be redetected.

The Subcommittee further decided that an extensive *subsurface* localizing and tracking capability is economically beyond Canadian means and probably also technically impossible, in view of the potential number of submarines that can be deployed, the vast area involved, and the oceanic environment.

However, the Subcommittee considered that it is important to have a limited subsurface localizing and tracking capability to give warning of any unusual maritime activity.

10.3 Limited surface and subsurface challenge and/or destruct capability

The Subcommittee recommends that Canadian maritime forces have a limited surface and subsurface challenge and/or destruct capability.

In the case of commercial or other non-military violations of Canadian sovereignty or extra-territorial jurisdiction, this capability is necessary as a deterrent and to enforce Canadian laws. This limited capability now exists only with respect to surface maritime activity within Canadian territorial waters and existing fishing zones. Since submarine transport rather than surface transport may become the rule in the waters of the Arctic archipelago, the Subcommittee suggests that the Canadian Government consider and develop appropriate techniques and procedures for a non-military challenge to submarines.

In the case of military threats to Canadian security, the Subcommittee concludes that a limited challenge and/or destruct capability is required, pri-

marily to deter the deployment of SLBM-armed submarines closer to shore than maximum range.

At present Canada has only a limited destruct capability with respect to SLBM-armed submarines in the CANLANT area and to a lesser extent in its Pacific area of responsibility. The Subcommittee considers that an extensive capability in this field is economically, if not technically, impossible, for reasons already summarized in the previous subsection.

10.4 Self-defence capabilities for maritime forces

The Subcommittee recommends that the surface vessels of Canadian maritime forces have some basic self-defence capabilities, which in practice may be most useful in connection with the exercise of police functions. In the light of the strategic considerations discussed and discounted in Section 6, the Subcommittee does not recommend highly sophisticated self-defence systems, such as anti-aircraft missiles.

10.5 Capabilities in the Arctic

The combination of oceanic conditions in the Canadian Arctic—year-round ice in some areas and seasonal ice in others, large areas of relatively shallow waters, and the archipelago itself consisting of numerous islands separated by relatively narrow bodies of water—provides a unique maritime problem, with respect both to maintenance of sovereignty and to defence against any threat to security originating in the Arctic.

Ice coverage limits the effectiveness of all maritime systems in more or less drastic ways. Surface vessels, other than heavy icebreakers, effectively cannot operate in the arctic. If they are strengthened to resist floating ice, they become too slow for open waters. Hovercraft provide a potential for such surface movement which is being explored, but their range will be, at best, limited. Maritime patrol aircraft can effectively detect surface activity, but movement of ships is virtually non-existent. Because of ice cover, such aircraft have no capability for underwater surveillance. The effectiveness of bottom-based detection systems is somewhat reduced by ice "noise". The nuclear-powered submarine is the one vessel capable of relatively free movement in arctic waters. With hull strengthening it can even break through the ice pack and surface.

The large areas of shallow waters less than 20 fathoms in depth limits the area of feasible submarine operations. Areas of water of more than 20 fathoms in depth are two types: (1) connecting channels from the Arctic Ocean (North West Passage and Nares Strait) to Baffin Bay as well as the Davis Strait from Baffin Bay to the Atlantic; and (2) cul de sacs and underwater bays from the perimeter of the archipelago, or from connecting channels, the largest and most significant being Hudson Strait and part of Hudson Bay.

The Subcommittee believes that the connecting channels have potential importance as transit routes through the Arctic archipelago for both military and non-military submarines. It sees some future possibility of exploitation of the channels and of the cul de sacs and underwater bays for strategic or commercial purposes. The Subcommittee does not consider military exploitation of either the channels (other than for transit) or other areas is now taking place. But the unique character of Arctic waters and the unknown Arctic geography make it important that Canada develop further competence

and experience in the Arctic environment so as to be able to meet a threat if it should develop in these waters.

The Subcommittee concludes that it would be desirable, if technically and economically feasible, for Canada to acquire a subsurface *perimeter* surveillance and identification capability to cover the entrance to connecting channels (and possible to cul de sacs) where submarines can operate. To make this perimeter surveillance and identification capability effective, it would have to be backed up by a limited localizing and tracking capability.

The Subcommittee was told that four additional large ice-breakers would be required by the Canadian Coast Guard, to keep open Arctic sea routes, if a decision were taken to ship arctic oil by surface tankers. The Subcommittee understands and agrees that some additional capability is needed only if maritime surface transportation of oil proves to be technically and commercially feasible or if the minerals in the central and eastern arctic become commercially attractive.

11. RECOMMENDED EQUIPMENT AND STRUCTURE FOR CANADIAN MARITIME FORCES

In order to develop and maintain the capabilities recommended in Section 10 for the next decade, the Subcommittee envisages a large and continuing re-equipment programme. While some of the recommendations involve the replacement of existing equipment, the Subcommittee urges the Government seriously to consider the possibility of procuring new maritime systems to take account of new technological developments and new requirements, particularly in the Arctic.

In summary the Subcommittee recommends:

- (1) the continued maintenance of long range airborne maritime patrol forces to provide considerable surveillance and identification as well as limited localizing, tracking and challenge and/or destruct capabilities;
- (2) the maintenance of surface forces, with the emphasis on light and fast general purpose vessels to provide limited surveillance as well as limited localizing, tracking and challenge and/or destruct capabilities;
- (3) careful consideration of the possibility of developing and deploying in appropriate locations in Arctic regions bottom-based systems providing these are found to be capable of effective surveillance and identification under ice;
- (4) no acquisition of nuclear powered submarines, given the high estimated cost.

The Subcommittee was impressed by the evidence of the Department of National Defence that no single platform or detection system could provide the appropriate capabilities given the varied maritime activity and the varied oceanic environment to be covered. In the opinion of the Subcommittee the general types of equipment recommended are of a complementary nature and would provide a limited Canadian capability in all Canadian waters.

In addition the Subcommittee accepted that Canadian maritime forces will continue to require specialized equipment for icebreaking, to service navigation aids, and to provide facilities for research and data collection.

11.1 Airborne maritime patrol forces

The Subcommittee understands that no final decision has been taken whether to replace the Argus with a new maritime patrol aircraft in the near future or to modify the equipment in the Argus in order to extend its useful life. The Minister of National Defence reported to the Standing Committee on External Affairs and National Defence on March 10, 1970, that his Department was evaluating the Orion and the Nimrod. Evidence indicated that the Orion P3C (developed by Lockheed Corporation U.S.A.) and the Nimrod (developed by Hawker Siddeley, U.K.) are both appropriate aircraft to replace the Argus and are currently available. Although members of the Subcommittee had an opportunity to inspect an Orion in Norfolk, Virginia, the Subcommittee realizes that it is not in a position to evaluate the merits of each aircraft on technical grounds. Nor does it feel able to make a recommendation as between procuring a new aircraft or extending the life of the Argus. It is, however, convinced that Canadian maritime forces must be equipped with an adequate number of effective maritime patrol aircraft.

Working in conjunction with bottom-based detection systems, the Subcommittee regards maritime patrol aircraft as providing a considerable surveillance and identification capability for the Atlantic and Pacific areas, as well as providing limited localizing, tracking challenge and/or destruct capabilities. These capabilities can be supplemented for an interim period by the use of shore based CS2F Tracker aircraft presently available.

Maritime patrol aircraft are also able to provide a considerable *surface* surveillance and detection capability in the Arctic, and the Subcommittee has been told that maritime patrol flights in the far north have been sharply increased. However, in view of the large size of the area involved and the absence of shipping activity, the Subcommittee doubts whether the use of an aircraft with expensive specialized equipment is justified when visual observations are essentially involved. However, it does recognize a need for some training experience and a requirement for basic intelligence on the Arctic region to which such flights undoubtedly make some contribution.

The Subcommittee suggests that the possibility of using observation satellites to provide regular surveillance of the Arctic regions should be examined. It is aware of the high cost of such systems and recognizes that a specialized observation satellite programme is out of the question. However, it understands that the possibility of using satellites to conduct earth resources surveys over Canada's North is being carefully studied. The Subcommittee suggests that equipment capable of conducting such surveys might with minor adaptation offer some capacity for regular surveillance at slight extra cost. The definition would, however, be coarse so that activity on a small scale would not be detected. Nevertheless, if an adaptation could be made to a satellite programme intended primarily for other purposes, the Subcommittee believe that the more extensive flights now being scheduled in the Arctic could be cut back. It would be necessary, however, to complement the surveillance capability of a satellite with aircraft (probably operated by Canadian ground forces) which would be capable of inspecting any suspicious activity and perhaps even have some capability of landing on ice for close investigation. The Subcommittee believes such a system would provide for more effective coverage of Canada's Arctic regions at reasonable cost than the present maritime patrol flights now offer.

The Subcommittee has learned that arrangements have been made for maritime patrol aircraft to use facilities at the airport at Frobisher Bay. The

Subcommittee considers this to be an important measure to extend the effective range of maritime patrol aircraft, both over the North Atlantic and over the Canadian Arctic. It received evidence regarding the feasibility of building a combined air and maritime base on Devon Island. While Frobisher provides a good air base, the harbour has bad ice conditions which prohibit its use during most of the year. Ice conditions on Devon Island are said to be superior. In view of the still uncertain future of surface maritime activity in the Arctic and the very large cost which would be incurred, the Subcommittee does not believe grounds exist at this time for developing a new base on Devon Island.

A more difficult problem faces the Committee with regard to the air base at Goose Bay. At present, this base is in effect not used by Canadian forces. Maritime patrol aircraft on the east coast now fly out of Greenwood and Summerside and use Shearwater on occasion. These three bases are within a 100 mile radius and therefore do not add to the effective range of the aircraft. Use of Goose Bay would provide an important northward extension and cut down transit time for regular flights to the North Atlantic. (The base could also be used for interceptor aircraft if it were to be reactivated.) These advantages are clearly understood by the Subcommittee, but it is also aware that reactivation of Goose Bay would only make sense if Greenwood or Summerside were to be closed down. Since these two bases each provide very important income support to the provinces in which they are situated (the importance of defence spending in the Atlantic provinces has been touched on in Section 7), the drastic step of closing a base could only be defended if compensatory financing arrangement were to be made. The Subcommittee believes that this possibility should be seriously examined, since the present arrangements result in significant defence expenditures which are not fully justifiable in terms of the defence contribution provided.

11.2 Surface forces

The Subcommittee recommends that surface forces comprising light and fast general purpose vessels be maintained to provide a limited surface and subsurface localizing, tracking and challenge/destroy capability. Such forces would provide the facility required both for ASW and for police functions and to meet international commitments in the Atlantic and Pacific areas. Present surface forces maintained by the Department of National Defence—DDEs, DDH and 280 class destroyers—can provide such a capability during their remaining operational life. When the older vessels are being replaced, the Subcommittee considers some should be replaced by a greater number of smaller and faster surface vessels. If the sea trials of the hydrofoil now underway are successful, the Subcommittee believes it might be well suited to fill these roles.

Now that the government has taken steps to extend Canadian's territorial waters and to establish fisheries and pollution control zones, the Subcommittee believes that a distinction may appropriately be made between inshore and offshore police capabilities (i.e. law enforcement, fisheries protection, pollution control, seabed exploitation). Evidence given to the Subcommittee suggested that inshore police type activities involved in the main local maritime activity and required an intimate and personal knowledge of the area concerned. Offshore police capabilities necessitate enforcement over wider areas, in more varied weather conditions and with respect to both Canadian and non-Canadian maritime activity. With the extension of Canadian waters and jurisdiction and with increasing levels of exploitation of all sea resources, there is a need for more sophisticated maritime forces with more formally organized

material and intelligence support. While the question of final responsibility for specific facets of such offshore policing may rest with departments other than the Department of National Defence, the Subcommittee considers it important that the Department of National Defence maritime forces should have a limited capability and authority to support this requirement.

11.3 Bottom-based surveillance systems

The Subcommittee understands that bottom-based systems for surveillance and identification provide an excellent capability for continuous surveillance and identification of surface and subsurface maritime activity over wide areas, particularly over the continental shelf and slope.

Their use in the Arctic is made difficult by ice damage to equipment and by background ice "noise". However, given Canada's need for a subsurface surveillance capability in the Arctic, the Subcommittee recommends that research and development of bottom based systems appropriate for Arctic operations be given high priority in order to determine whether effective operational systems could be established and at what cost.

11.4 Submarine forces

The Subcommittee closely examined the question whether Canada should acquire nuclear-powered submarines. It should be made clear that when referring to nuclear-powered submarines the Subcommittee is considering the submarines' propulsion systems and not the nature of their armament. In the past, this possibility has been rejected because of the extremely high capital costs and the substantial support costs (maintaining two crews per submarine, special communications requirements and other facilities). Canadian shipyards probably lack the expertise, at this time, to build nuclear submarines which has undoubtedly been a further deterrent.

It may be possible to substantially reduce acquisition costs by means of buying or leasing used nuclear-powered submarines. No evidence, however, was received as to what these costs might be.

If purchase costs could be greatly reduced, then the Subcommittee could more readily attach importance to the following arguments for the acquisition of the nuclear-powered submarine:

- (1) it is the only maritime vehicle capable of year round operation in Arctic waters. It would be an essential support to a bottom-based detection system. If a bottom-based system for Arctic waters proves impossible to devise, the nuclear-powered submarine would give an initial detection capability as well.
- (2) it has proven to be the most effective subsurface surveillance method. If Canadian maritime forces were equipped with a small number of nuclear-powered submarines, they could effectively complement the existing surface and air borne forces and result in increased Canadian knowledge of the activities of other submarine forces.
- (3) it offers a platform for carrying out detailed hydrographic surveys of Arctic waters. Areas of these waters have been charted during periods when the waters are open by the Canadian Hydrographic Service and Department of Transport, but this is not

feasible in seas which are covered with permanent ice. Evidence submitted by General Dynamics to the Commons Committee on Indian Affairs and Northern Development indicates that surveys to locate underwater pinnacles in the area of proposed submarine transport routes would have to be made by submarines prior to establishing any such routes.

- (4) it may become a commercially viable means of exploiting arctic oil. Given the extent of Canadian resources involved, the Subcommittee considers that Canada has an interest in developing knowledge and experience in this area of technology. There might even be important technological spin-off benefits to be gained. If the General Dynamics proposal—or one like it—to ship oil by submarine tanker should prove to be feasible, a trans shipment port with repair facilities might be established in Canada. If this were done, the cost of maintaining Canadian submarines could be reduced.

Although evidence suggested that there are many potential advantages in terms of protection of sovereignty, exploration of Arctic waters and the development of a new technology of possible industrial importance, the Subcommittee does not consider that it should make a recommendation that Canada seek to acquire nuclear-powered submarines in the period 1973-83, unless it can be shown that acquisition costs would be very much less than the figure given of \$100,000,000 per submarine.

11.5 Allocation of expenditure on maritime forces

The Subcommittee has already noted that regional and technological side benefits accrue from the development of maritime forces. Irrespective of the ultimate organizational structure for the maintenance and operation of the combined Canadian maritime forces, the actual benefits accruing from the expenditures will be of such diverse nature that allocation of both capital and operating expenditures must be considered accordingly.

At present the maintenance and operation of maritime forces by various departments on a functional basis insures that the costs of providing these functions are roughly apportioned to appropriate government spending agencies, (i.e. the Department of National Defence, Transport, Fisheries and Forestry, the Solicitor General (RCMP) and Public Works). Such an assignment of costs does not appear, however, to take into account the incidental support provided by the development and operation of maritime forces to other government spending agencies, notably the Departments of Regional Economic Expansion, Indian Affairs and Northern Development and Industry, Trade and Commerce.

The increasingly capital and technological intensive character of maritime forces development as well as their multi-functional potential results in the benefits becoming more widespread and diffuse than has hitherto been the case. In the view of the Subcommittee the development of maritime forces has in this respect many attributes of a national policy. Accordingly it recommends that a detailed cost-benefit analysis of current and future development and operations of Canadian maritime forces be carried out by the Government and that the capital expenditure and operating costs be apportioned to each government spending agency benefiting from these. The department(s) actually maintaining and operating maritime forces would then be in a position to

recoup appropriate expenditures made to the benefit of other departments and a realistic assessment of the cost of maintaining maritime forces for the assertion of sovereignty, collective security, and other purposes could be obtained.

The Subcommittee notes that the adoption by the Government of the Planning-Programming-Budgeting-System (PPBS) approach to expenditure and the new form of presentation of Estimates to the House of Commons makes such an apportionment of costs of maritime forces possible once a comprehensive and detailed cost-benefit analysis has been carried out.

11.6 Organizational considerations

The Subcommittee has given considerable attention to the question of whether the Canadian maritime forces maintained by the various government departments should be integrated. The present divided structure appears to be somewhat unusual, with most nations consolidating their maritime forces under operational control of one or two agencies.

The primary argument for integration of maritime forces is to achieve greater co-ordination of operations and, particularly, more efficient use of equipment through multi-tasking. This would involve the delegation of appropriate authority for both military and non-military duties to officers commanding vessels. The Subcommittee considers that such integration might well facilitate better planning of operations, and achieve economies through use of common support and training facilities.

Several arguments against total integration of Canada's maritime forces were presented to the Subcommittee. Of these, four seemed particularly relevant:

First, total integration of all Canadian maritime forces under the Department of National Defence appeared inadvisable from an organizational point of view. It would be inconsistent with the reorganization of the Canadian Armed Forces as a unified military force; extend the scale of military operations into non-military areas and make civilian control of such operations more difficult; and might give the impression that Canada was increasing the size of and expenditures on its armed forces.

Secondly, the existence of separate maritime services has permitted innovation and development in non-military areas of expertise such as ice-breaking and oceanography that might well have not been given any priority in a single integrated service facing other more immediate demands.

Thirdly, the increasing potential use of maritime forces to enforce sovereignty and extra-territorial jurisdiction against non-military violation or exploitation, possibly by Canada's military allies as well as others, may make it desirable on occasion for non-military maritime forces to be able to carry out police type functions, thereby avoiding any military implications.

Fourthly, personnel of the various existing maritime forces had often joined these specifically because of the work carried out and the specializations involved. Although integration of all the maritime forces would provide greater possibilities for mobility and advancement, the Subcommittee concluded that this was not necessarily desirable from the point of view of either the services or the personnel involved, in that it might dilute the specialization currently developed and maintained. Further, there seemed some doubt that those who had deliberately joined, or would in the future join, a non-military service would serve or want to serve in the armed forces (or vice versa).

In conclusion, the Subcommittee recommends against the integration of all Canadian maritime forces as a single service. However, it does recommend that the Government consider:

- (1) the possible integration of non-military maritime forces having responsibility for day to day surface operations with respect to transport, fisheries protection and law enforcement at sea as an enlarged Canadian Coast Guard, the latter acting as an autonomous government agency, providing all non-military maritime services to other government departments on demand.
- (2) the integration of military and non-military maritime forces having responsibility for research and data collection as a specialized service, this not precluding the incidental use of Canadian Coast Guard or Department of National Defence vessels and aircraft for such activities when available.
- (3) the assignment of concurrent authority and responsibility to commanding officers of Department of National Defence submarines, surface vessels, or aircraft and to those of Canadian Coast Guard vessels for the enforcement of Canadian sovereignty and extra-territorial jurisdiction against non-military violation of exploitation, particularly with respect to off-shore violations of the 12 mile territorial limit and the fisheries and pollution control zones beyond.
- (4) other measures to ensure that the greatest degree of co-ordination of maritime activities of the various services is maintained and that, where possible, equipment of these forces is multi-tasked for maximum efficiency. An example of this kind of special service might be emergency task forces trained and equipped for immediate action to control oil pollution in the event of damage to tankers. Just as air-sea rescue is directed by the Department of National Defence, the Subcommittee believes the Department of National Defence might also be made responsible in this field.

The Subcommittee, while recommending against the total integration of all maritime forces under a single organization, does propose that any bottom-based systems and submarines which might be acquired be maintained and operated by the Department of National Defence. Even though these facilities might be used in part for surveillance and identification of non-military maritime activity, the technologies and expertise involved in operating them are clearly of such a highly specialized nature that duplication is impracticable and uneconomic.

11.7 Reserve Forces

The Subcommittee did not consider in detail appropriate functions for and structure of naval reserve forces. However, it would appear that naval reserve forces could, and should, be appropriately trained to supplement regular maritime forces in carrying out their police functions (including control of shipping when any emergency requires this) and search and rescue. The Subcommittee feels that reserve forces should not only be considered as a reservoir of expertise for use in the event of general hostilities but also utilized to supplement regular forces in dealing with peak period operations and unexpected day-to-day contingencies (such as large scale search and rescue operations) which would otherwise have to be met *in toto* by regular forces. The availability of

appropriately trained reserve forces for such unexpected *ad hoc* duties would, in the opinion of the Subcommittee, permit more efficient and effective use of regular forces.

The Subcommittee further considers it might be useful if reserve officers and men, on occasion, be seconded to the Coast Guard for experience in Arctic surface operations.

Moreover, in the opinion of the Subcommittee, sufficient regular force personnel should be assigned to the training of reserve forces to ensure that the reserve will be able to reach the standard of competence required to fulfil its tasks.

A copy of the relevant Minutes of Proceedings (*Issue No. 32*) is tabled.

Issue No. 32 (Second Session of the 28th Parliament) of the Minutes of Proceedings and Evidence of the Standing Committee on External Affairs and National Defence contains the Minutes of Proceedings dealing with the Report on Canadian Maritime Forces. The unclassified Evidence received by the Subcommittee on Maritime Forces is published in Issue No. 34.

ANNEX A

Supplementary written material provided to the Subcommittee on Maritime Forces in conjunction with visit to Halifax area, September 7-11, 1969

1. House of Commons Committee on National Defence *Proceedings* June 23, 1966, pp 310-328, evidence of Rear Admiral W. M. Landymore on Maritime Command.
2. House of Commons Standing Committee on External Affairs and National Defence *Proceedings* February 4, 1969 pp 842-845, evidence of the Department of National Defence on roles and operations of Maritime Command.
3. Department of National Defence: Memorandum: *An historical background of Maritime Forces 1945-31 March 1969*.
4. Department of National Defence: Memorandum: *Capital and operating costs of Maritime Command*.
5. Department of National Defence: *Standing Committee on External Affairs and National Defence, Halifax, 1969* (a document on Maritime Command facilities and personnel).
6. Department of Fisheries and Forestry: *Resume of the objectives, work and resources (manpower and equipment) of the Conservation and Protection Branch, including attached detail of vessels and support facilities in Maritime Region*.
7. Department of Transport: *The Canadian Coast Guard*, document supplied by Information Services, Department of Transport, Ottawa.
8. Department of Transport: Organization Chart, Maritime Region, Department of Transport.
9. Department of Energy, Mines and Resources: *Bedford Institute Biennial Review 1967-68*.
10. Department of Energy, Mines and Resources: Press release (January 16, 1969) on Canadian oceanographic expedition.
11. Department of Energy, Mines and Resources. Memorandum: *Welcome to the Bedford Institute*.
12. Fisheries Research Board: *Fisheries Research Board: What it is and what it does*.
13. G. R. Lindsey: *Canadian Maritime Strategy: should the emphasis be changed?* paper submitted to the House of Commons Standing Committee on External Affairs and National Defence, August 1969.
14. G. R. Lindsey: "The Submarine Environment" *Air Force College Journal*, 1963.
15. John P. Craven: "Sea Power and the Sea Bed" *U.S. Naval Institute Proceedings*, April, 1966.
16. H. G. Dudley: "The Future Role of Soviet Sea Power" *U.S. Naval Institute Proceedings*, May 1966.
17. H. B. Sweitzer: "Sovereignty and the SLBM" *U.S. Naval Institute Proceedings*, September 1966.
18. Navy League of Canada: *Submission to the House of Commons Standing Committee on External Affairs and National Defence*, April 3, 1969.
19. John Gellner: "A Case for sinking the new destroyers" *Globe and Mail*, November 21, 1968.
20. Rear Admiral W. L. Landymore: "An Admiral's case for a Canadian Navy" *Globe and Mail*, January 8, 1969.

Other Supplementary Written Material Provided to the Subcommittee on Maritime Forces

21. Kari Levitt: "A Macro Economic Analysis of the Structure of the Economy of the Atlantic Provinces 1960", Montreal, June, 1969.

DEPARTMENT OF TRANSPORT
(Canadian Coast Guard Vessels)

ANNEX B

(Compiled from Sessional Paper 2/483)

1) Ships over 50' in length				March 2, 1970				
Location and Name of Vessel	Reg Gross	Tonnage Net	Construction Date	Use	No. Deck Officers	No. Engine Room Officers	No. other Personnel	Vessel under Construction
<i>St. John's, Newfoundland</i>								
John Cabot	5097	1932	1965	Cable Repair Ship—Ice Strengthened.	6	5	69	
Sir Humphrey Gilbert	1931	683	1959	Icebreaker Supply and Buoy Vessel.	4	5	31	
Bartlett	1317	491	1969	Light Icebreaking Supply and Buoy Vessel.	4	4	22	Delivery Date 3/12/69
Sea Beacon	63	33	1952	Supply Vessel—Buoy Tender.	2	1	4	
Prima Vista	65	41	1955	Pilot Vessel and Aids Tender.	1	1	4	
<i>Dartmouth, Nova Scotia</i>								
John A. Macdonald	6186	2764	1960	Major Icebreaker.	5	5	67	
Louis S. St. Laurent	10908	5370	1969	Major Icebreaker.	5	5	71	
Labrador	3823	1589	1954	Major Icebreaker.	5	5	88	
Rally	140	35	1962	Search and Rescue Cutter.	4	4	16	
Rapid	140	35	1963	Search and Rescue Cutter.	4	4	16	
Alert	1752	495	1969	Search and Rescue Cutter.	4	5	28	Delivery Date 15/12/69
Sir William Alexander	2154	989	1959	Icebreaker Supply and Buoy Vessel.	4	5	33	
Provo Wallis	1313	489	1969	Light Icebreaking Supply and Buoy Vessel.	4	4	22	
Narwhal	2064	931	1963	Supply and Buoy Tender and Depot Ship.	4	5	26	
Skua	1102	690	1946	Northern Supply Vessel.	4	4	15	
<i>Charlottetown, P.E.I.</i>								
Wolfe	2022	724	1959	Icebreaker Supply and Buoy Tender.	4	5	33	
Tupper	1357	419	1959	Light Icebreaker Supply and Buoy Vessel.	4	5	29	

DEPARTMENT OF TRANSPORT (Concluded)

Location and Name of Vessel	Reg Gross	Tonnage Net	Construc- tion Date	Use	No. Deck Officers	No. Engine Room Officers	No. other Person- nel	Vessel under Construction
<i>Parry Sound, Ontario</i>								
Alexander Henry	1674	572	1959	Light Icebreaker Supply and Buoy Vessel.	4	5	28	
Porte Dauphine	347	144	1952	Great Lakes Research.	3	3	11	
Montmorency	751	245	1957	Light Icebreaker Supply and Buoy Vessel.	4	4	23	
Parry Sound	33	22	1950	Agency Workboat.				
Nokomis	64	41	1957	Agency Workboat.	1	1	2	
<i>Vancouver, B.C.</i>								
Racer	140	34	1963	Search and Rescue Cutter.	4	4	16	
Ready	140	34	1963	Search and Rescue Cutter.	4	4	16	
Rider	139	34	1963	Search and Rescue Cutter.	4	4	16	
<i>Victoria, B.C.</i>								
Quadra	5536	1329	1967	Oceanographic Weathership.	5	5	56	
Vancouver	5537	1929	1966	Oceanographic Weathership.	5	5	56	
Camsell	2022	724	1959	Icebreaker Supply and Buoy Vessel.	4	5	34	
Sir James Douglas	564	173	1956	Buoy Tender and Supply Vessel.	4	4	20	
<i>Prince Rupert, B.C.</i>								
Skidegate	136	35	1964	Buoy Tender and Supply Vessel.	2	2	8	
Alexander MacKenzie	576	241	1950	Lighthouse and Supply Vessel.	4	4	21	
<i>Hay River, N.W.T.</i>								
Tembah	178	53	1963	MacKenzie River Aids Tender.	2	2	5	
Eekaloo	165	73	1961	MacKenzie River Aids Tender.	2	1	5	
Dumit	104	48	1958	Great Slave Lake Aids Tender.	2	1	5	
Miskanaw	104	47	1958	Athabasca Lake Aids Tender.	2	1	5	

Location and name of vessel	Reg Tonnage		Construction Date	Use	Status
	Gross	Net			
Safeguarder	665	189	1914	Training Vessel	
Sambro	527	122	1956	Training Vessel	

Pilot vessels	Location	Registered Tonnage	Construction Date	Use	No. Deck Officers	No. Engine Officers	No. other Personnel
Canada Pilot No. 4	Halifax, N.S.	15	1967	Pilot Tender	4	—	2
Canada Pilot No. 5	Halifax, N.S.	26	1953	Pilot Tender	3	—	3
Canada Pilot No. 8	Saint John, N.B.	41	1958	Pilot Tender	3	3	6
Canada Pilot No. 9	Les Escoumins, P.Q.	25	1961	Pilot Tender	2	2	3
Canada Pilot No. 10	Les Escoumins, P.Q.	26	1962	Pilot Tender	2	2	2
Canada Pilot No. 21	Victoria, B.C.	23	1944	Pilot Tender	3	—	3
Canada Pilot No. 22	Prince Rupert, B.C.	19	1932	Pilot Tender	2	2	2

2) Annual operating costs—1966/67	\$ 21,958,200.
1967/68	\$ 25,597,700.
1968/69	\$ 26,801,000.

3) Under construction	—CCGS BARTLETT Scheduled for delivery Dec. 1969.
	CCGC ALERT “ Dec. 1969.
	CCGS GRIFFON “ Feb. 1970.
	Canada Pilot No. 23 “ Jan. 1970.

DEPARTMENT OF FISHERIES & FORESTRY

1) Ships over 50' in length

Name	Construction Date	Location	Tonnage			Use	Personnel		Annual Operating Cost
			Length	Gross	Reg'd		Officers	Men	
Artica	1964	St. John's Nfld.	164'	702	278	Refrigerated Bait Vessel	6	10	\$152,600
Badger Bay	1956	Grand Banks, Nfld.	57'	48	42	Patrol	1	2	26,500
Belle Bay	1957	St. John's, Nfld.	69'	57	39	Patrol	2	2	33,400
Burin Bay	1967	St. John's, Nfld.	66'	62	20	Patrol	2	2	32,800
Cape Freels	1962	St. John's, Nfld.	179'	696	185	Patrol	9	17	210,000
Eastern Explorer	1949	St. John's, Nfld.	73'	122	58	Patrol	4	3	52,300
Garia Bay	1969	St. John's, Nfld.	61'	54	19	Patrol	2	2	32,800
Gander Bay	1969	Cornerbrook, Nfld.	66'	62	20	Patrol	2	2	32,500
Goose Bay	1969	St. John's, Nfld.	66'	62	20	Patrol	2	2	33,000
Hawk Bay	1965	Twillingate, Nfld.	66'	62	19	Patrol	2	2	32,500
Pistolet Bay	1967	Arnold's Cove, Nfld.	66'	63	19	Patrol	2	2	32,500
Chebucto	1966	Halifax, N.S.	179'	751	188	Patrol	9	15	221,200
Cobequid Bay	1967	Digby, N.S.	70'	76	25	Patrol	2	3	38,200
Lacuna	1956	Halifax, N.S.	69'	61	27	Patrol	2	3	33,200
Cratena	1953	Lunenburg, N.S.	69'	56	15	Patrol	2	3	35,900
Cumella	1951	Grand Manan Island	69'	59	25	Patrol	2	3	42,100
Cygnus	1959	Halifax, N.S.	153'	524	122	Patrol	9	15	212,900
Maces Bay	1961	St. Andrews, N.B.	60'	61	26	Patrol	2	3	38,200
Sabella	1954	Sydney, N.S.	70'	58	40	Patrol	2	3	36,500
Shediac Bay	1960	Halifax, N.S.	60'	50	28	Patrol	2	3	40,500
Arrow Post	1946	Queen Charlotte Island	56'	46	19	Patrol	2	2	43,000
Atlin Post	1946	Nanaimo, B.C.	61'	47	23	Patrol	3	2	66,500
Babine Post	1946	Kitimat, B.C.	56'	53	34	Patrol	2	2	31,700
Chilco Post	1946	New Westminster, B.C.	63'	51	19	Patrol	2	3	51,700
Clavella	1946	Prince Rupert, B.C.	52'	38	26	Patrol	2	2	44,200
Comox Post	1946	Port Alberni, B.C.	54'	46	34	Patrol	3	2	34,500
Cutter Rock	1967	Prince Rupert, B.C.	53'	36	25	Patrol	2	1	33,600
Howay	1936	Victoria, B.C.	116'	198	44	Patrol	6	8	157,600
Kitimat	1939	Prince Rupert, B.C.	80'	79	29	Patrol	3	3	77,200

Laurier	1936	Victoria, B.C.	113'	201	82	Patrol	6	8	153,900
Sooke Post	1946	Queen Charlotte Island	56'	52	34	Patrol	2	2	38,000
Stuart Post	1946	Alert Bay, B.C.	54'	44	17	Patrol	2	2	33,100
Tanu	1968	Victoria, B.C.	170'	746	204	Patrol	8	14	301,700
TOTAL							109	148	\$2,436,300

FISHERIES RESEARCH BOARD OF CANADA

1) Ships over 50' in length

Vessel	Length	Regist- ered Tonnage	Const. Date	Present Location	Use	No. of		Other	Operating Costs	
						Deck Officers	No. Engine Room Officers	Personnel	1968-69	1967-68 1966-67
A. T. Cameron	177'	330.1	1958	St. John's, Nfld.	Research	3	3	21	294,286	280,222 272,747
Investigator II	78'6"	51.9	1946	St. John's, Nfld.	"	2	2	5	76,598	78,440 77,284
Marinus	62'8"	35.1	1953	St. John's, Nfld.	"	1	1	4	46,683	54,176 48,047
Harengus	77'6"	48.0	1946	Halifax, N.S.	"	2	2	5	86,767	75,689 76,213
Mallotus	53'8"	12.7	1951	St. Andrews, N.B.	"	1	—	1	14,400	18,040 13,141
E. E. Prince	130'	114.7	1966	St. Andrews, N.B.	"	3	3	8	173,644	169,969 74,753
			(Sept.)						(part year only)	
G. B. Reed	177'	363.2	1962	Nanaimo, B.C.	"	3	3	20	259,344	291,186 298,206
A. P. Knight	72'5"	77.6	1956	Nanaimo, B.C.	"	2	2	2	73,096	82,294 65,661
Investigator No. 1	54'3"	36	1944	Nanaimo, B.C.	"	2	2	1	39,818	47,178 51,222
Caligus	51'	28.1	1967	Nanaimo, B.C.	"	1	—	—	3,677	— —
Navicula	61'	23.9	1968	Ste. Marguerite's Bay, N.S.	"	1	1	1	39,018	— —
			(Oct.)							

No new vessels are under construction. Two new vessels will be constructed in 1971-72; three replacements are scheduled for 1971-72, two for 1972-73, and three for 1973-74 and 1974-75.

DEPARTMENT OF ENERGY, MINES AND RESOURCES

1) Ships over 50' in length

Name	Gross Tonnage	Registered Tonnage	Year Built	Location and Use	Deck Officers	Engineer Officers	Crew
Hudson	3721	1686	1962	Dartmouth, N.S.	5	12	47
Baffin	3460	1319	1956	Dartmouth, N.S.	5	10	59
Kapuskasing	1085	340	1943	Dartmouth, N.S.	4	5	46
Dawson	1314	462	1968	Dartmouth, N.S.	5	5	22
Parizeau	1314	462	1967	Victoria, B.C.	5	5	22
Wm. J. Stewart	1295	606	1932	Victoria, B.C.	4	5	49
Acadia (1)*	846	439	1913	Pictou, N.S.	4	3	42
Limnos	460	173	1968	Burlington, Ont.	3	3	10
Vector	516	187	1967	Victoria, B.C.	3	3	10
Marabell (1)*	316	201	1943	Victoria, B.C.	2	3	17
Maxwell	244	98	1961	Dartmouth, N.S.	1	2	10
Richardson	59	13	1962	Tuktoyaktuk, N.W.T.	1	1	3

(1)* To be retired from service at the end of the 1969 survey season.

2. Annual operating costs 1966-67 - \$3,466,844.
1967-68 - \$3,598,870.
1968-69 - \$3,703,895.

DEPARTMENT OF THE SOLICITOR GENERAL
(Royal Canadian Mounted Police)

1) Ships over 50' in length

Ship	Length	Displaced Tonnage	Constructed	Location	Ships Crew				Operational Costs		
					Use	Officers	Ncos	Marine Constables	1966/67	1967/68	1968/69
Wood	178'	700	1958	Halifax, N.S.	L	1	8	25	\$338,342	\$329,786	\$355,098
Fort Steele	118'	164	1958	Halifax, N.S.	A	1	7	11	344,931	194,000	226,733
Acadian	65'	48	1959	Fortune, Nfld.	W		2	2	40,648	50,934	51,195
Standoff*	75'	70	1967	Burin, Nfld.	E		2	2	138,760	39,425	53,470
Interceptor	65'	44	1955	North Sydney, N.S.	F		2	2	32,024	41,624	46,689
Detector	65'	44	1957	Saint John, N.B.	O		2	2	40,657	37,437	47,787
Adversus	65'	48	1959	Halifax, N.S.	R		2	2	44,871	40,351	55,444
Nicholson**	75'	70	1968	Pictou, N.S.	E		2	2	197,460	58,404	
Victoria	92'	85	1957	Esquimalt, B.C.	M		4	9	115,074	125,627	134,599
Tofino	65'	48	1959	Ocean Falls, B.C.	N	1			41,612	45,758	56,027
Sydney	55'	39	1959	Ganges, B.C.	P		2	2	49,795	42,120	43,785
Nanaimo	65'	44	1957	Prince Rupert, B.C.	A		2	2	55,353	45,699	49,565
Masset	65'	44	1958	Campbell River, B.C.	T		2	2	42,513	47,384	49,813
Little Bow II	55'	39	1958	Powell River, B.C.	R		2	2	42,044	51,568	44,516
Ganges	65'	48	1958	Port Alberni, B.C.	O		2	2	27,239	32,879	42,403
Alert	65'	48	1958	Alert Bay, B.C.	L		2	2	41,466	51,827	50,448
Captor	65'	48	1959	Bagotville, P.Q.	S		2	2	31,939	31,138	34,948

*1966/67. Costs include the Construction costs of this Patrol Boat.

**1967/68. Costs include the Construction costs of this Patrol Boat.

No vessels are currently under construction nor in advanced planning stages, but material has been submitted for inclusion in the Program Forecast for the replacement of one patrol boat in each of the fiscal years 1971-72, 1972-73, 1973-74 and 1974-75.

DEPARTMENT OF PUBLIC WORKS

1) Ships over 50' in length

Name	Registered Tonnage	Date Built	Home Port	Operational Duties	Deck Officers	Engine Room Officers	Crew
D.P.W. No. 400	219	1950	St. John's, Nfld.	Newfoundland Harbours—Dredging channels and entrances—Self-propelled Grab hopper dredge	2	2	6
D.P.W. No. 401	512	1953	St. John's, Nfld.	Newfoundland Harbours—Drilling and blasting rock in channels and entrances—Drill boat	2	2	7
D.P.W. No. 422	390	1954	St. John's, Nfld.	Newfoundland Harbours—Dredging harbours and entrances—Dipper dredge	3	2	13
Tug "Kelligrews"	18	1961	St. John's, Nfld.	Assisting Dredge D.P.W. No. 422—Towing scows, etc.	2	2	4
Launch Rigolet	13	1959	St. John's, Nfld.	Coastal waters Newfoundland and Labrador—Survey and inspection	1	1	2
Launch Makkovik	10	1959	St. John's, Nfld.	Coastal waters Newfoundland and Labrador—Survey and inspection	1	1	2
D.P.W. No. 16	48	1960	Halifax, N.S.	Nova Scotia Harbours—Dredging beside wharves and in channels—Clamshell dredge	2	1	2
D.P.W. No. 24	127	1955	Halifax, N.S.	Nova Scotia Harbours—Dredging beside wharves and in channels—Clamshell dredge	2	1	6
D.P.W. No. 23	127	1955	Saint John, N.B.	New Brunswick Harbours—Dredging at wharves and in harbours—Clamshell dredge	2	1	6
D.P.W. No. 30	29	1961	Saint John, N.B.	New Brunswick Harbours—Dredging at wharves and in harbours—Cutter suction dredge	1	1	2
D.P.W. No. 10	124	1959	Charlottetown, P.E.I.	Prince Edward Island Harbours—Dredging beside wharves and in channels—Clamshell dredge	1	1	5
D.P.W. No. 12	179	1960	Charlottetown, P.E.I.	Prince Edward Island Harbours—Dredging entrances and channels—Cutter suction dredge	3	1	9
Tug Glenlivet	60	1946	Charlottetown, P.E.I.	Prince Edward Island and Nova Scotia—General towing duties	2	2	3
D.P.W. No. 128	100	1948	Gaspe, Que.	Gaspe Peninsula—Dredging beside wharves and in channels—Clamshell Dredge	1	1	6
D.P.W. No. 129	100	1948	Magdalene Island, Que.	Magdalene Island—Dredging beside wharves and in channels—Clamshell dredge	1	1	6

D.P.W. No. 130	344	1949	Quebec City, Que.	St. Lawrence River Harbours—Dredging channels and entrances—Dipper dredge	1	1	13
Tug Bersimis	77	1930	Quebec City, Que.	Assisting Dredge D.P.W. No. 130—Towing scows, etc.	2	2	6
Launch Chicoute	13	1958	Quebec City, Que.	St. Lawrence River—Engineering surveys and inspections	1	1	2
D.P.W. No. 201	182	1965 (rebuilt)	Selkirk, Man.	Lake Winnipeg Harbours and Red River—Dredging channels—Self propelled—Cutter suction dredge	2	1	7
D.P.W. No. 205	351	1949	Selkirk, Man.	Lake Winnipeg—Dredging channels—Dipper dredge	1	1	7
D.P.W. No. 210	128	1960	Winnipegosis, Man.	Lake Winnipegosis—Dredging channels and harbours—Dipper dredge	1	1	7
Tug Bradbury	72	1915	Selkirk, Man.	Lake Winnipeg—Towing dredge plant and assisting other Government departments	1	1	6
Tug Peguis	3	1955	Selkirk, Man.	Assisting Dredge No. 205—Towing scows, etc	1	1	1
Tug Mossey	22	1949	Winnipegosis, Man.	Assisting Dredge No. 210—Towing scows, etc	1	1	1
D.P.W. No. 224	155	1954	Hay River, N.W.T.	Mackenzie River—Dredging channels—Cutter suction dredge	1	1	7
D.P.W. No. 250	121	1946	Waterways, Alta.	Athabaska River—Dredging beside wharves and in channels—Self propelled cutter suction dredge	2	1	6
D.P.W. No. 251	122	1947	Hay River, N.W.T.	Great Slave Lake—Dredging harbours and channels—Dipper dredge	1	1	5
D.P.W. No. 252	76	1951	Waterways, Alta.	Athabaska River—Dredging harbours and channels—Cutter suction dredge	1	1	4
D.P.W. No. 253	131	1958	Hay River, N.W.T.	Great Slave Lake—Dredging harbours and channels—Cutter suction dredge	1	1	5
Tug Sans Sault	35	1965	Hay River, N.W.T.	Assisting Dredge No. 251—Towing Scows, etc.	2	1	1
Tug Malta	41	1948	Hay River, N.W.T.	Assisting Dredge No. 224	1	1	0
McMurray—Tug	33	1955	Waterways, Alta.	Assisting Dredge D.P.W. No. 252—Moving Pipeline, etc.	1	1	0

DEPARTMENT OF PUBLIC WORKS (concluded)

1) Ships over 50' in length

Name	Registered Tonnage	Date Built	Home Port	Operational Duties	Deck Officers	Engine Room Officers	Crew
Hugh A. Young—Launch	45	1962	Hay River, N.W.T.	Mackenzie River—Engineering surveys and inspections	2	1	3
Atha—Snagboat	62	1957	Waterways, Alta.	Athabaska River—Removing snags and other obstructions	1	1	4
D.P.W. No. 312	717	1961	Vancouver, B.C.	Frazer River—Dredging channels—Self propelled drag suction Hopper dredge	2	4	13
D.P.W. No. 322	686	1955	Vancouver, B.C.	Frazer River—Dredging channels (two shifts)—Cutter suction dredge	4	2	34
Samson V—Snagboat	283	1958	Vancouver, B.C.	Frazer River—Removing snags and other obstructions and maintenance—Snagboat	2	1	11
Essington II—W	167	1958	Vancouver, B.C.	North Coast of British Columbia—Maintains remote structures—Workboat	2	2	10
Hilunga	35	1950	Vancouver, B.C.	British Columbia Coast—Engineering surveys and inspections—Launch	1	1	3
Skeena	34	1951	Vancouver, B.C.	South British Columbia Coast and East Coast Vancouver Island—Engineering surveys and inspections—Launch	1	1	1
Tsekoa	31	1953	Vancouver, B.C.	South Coast of British Columbia—Maintains remote structures—Workboat	1	1	5

Annual operating costs 1966-67 \$2,731,411

1967-68 \$2,539,458

1968-69 \$3,245,890.87

(Does not include Launches Rigolet, Makkovik, Chicoute, Hugh A. Young, Hilunga and Tsekoa)

The Department has no new vessels presently under construction or in advanced planning stage. One tug is scheduled to be replaced by a new vessel in 1972.

DEPARTMENT OF NATIONAL DEFENCE (Defence Research Board)

1) Ships over 50' in length

Name of Ships	Registered Tonnage	Construction Date	Location Location	Use	Deck Officers	Engineer Officers	Other Personnel
Fort Frances	1378	1944	Halifax	Employed in oceanographic and underwater research General service use	4	4	29
Quest	1811	1969	Halifax		4	5	28
Endeavour	1564 (Note)	1964	Esquimalt		4	4	30
Laymore	626	1944	Esquimalt		4	4	17
YFP	83	1953	Halifax		2	1	0

NOTE: This figure is displacement tonnage. Registered tonnage has not been measured for this vessel.

2) Annual operating costs: 1966/67 - \$1,011,654.00
1967/68 - \$1,187,875.00
1968/69 - \$1,233,998.00

3) Five ships under construction for Department of National Defence: one operational support ship will complete in 1970; two destroyers in each of 1971 and 1972. No ships under construction for Defence Research Board.

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